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WAR DEPARTMENT, SURGEON GENERAL'S OFFICE,
WASHINGTON, MARCH 1, 1877

A REPORT TO THE SURGEON GENERAL
ON THE
TRANSPORT OF SICK AND WOUNDED
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CIRCULAR No. 9.

WAR DEPARTMENT,

SURGEON GENERAL'S OFFICE,

Washington, March 1, 1877.

With the approval of the Honorable Secretary of War, the following Report, upon the different modes of transporting sick and wounded men in localities inaccessible to wheeled vehicles, embodying the experience of many years and various campaigns, is published for the information of the Medical Officers of the Army.

JOSEPH K. BARNES,

Surgeon General U. S. A.

A
REPORT TO THE SURGEON GENERAL
ON THE
TRANSPORT OF SICK AND WOUNDED
BY
PACK ANIMALS.

BY
GEORGE A. OTIS,
ASSISTANT SURGEON, U. S. ARMY.

GENERAL: The subject of the transport of sick and wounded by pack animals has latterly attracted much attention in the army. For several years, the contests with Indian savages in which the troops have engaged have been of unusual magnitude and difficulty; the expeditions have frequently penetrated into unexplored regions, and the engagements have taken place in situations altogether inaccessible to wheeled vehicles. The conditions of such warfare entail the necessity of modifying the arrangements for providing surgical assistance for the wounded or disabled. The ambulance equipment must be able to keep up with the troops, and not to interfere with their rapid movements; must provide the essentials of surgical aid far from a base of supply; and often improvise for the comfort of the wounded appliances that cannot possibly be transported. Under these circumstances, officers have recalled the expedients of the hardy explorers of the frontiers, and have endeavored to improve them or to adapt them to unexpected exigencies; and a number of interesting reports on the various devices employed have been transmitted to your office. In accordance with your instructions to collect and arrange these documents, and to combine them with such other information on the subject as may appear to be of interest, I have had the honor to prepare this report.

When it is recollected that it was not until the close of the last century that any systematic ambulance service was adopted in civilized armies, and only within twenty years that the completeness of organization now attained in some European armies has been acquired; and when consideration is given to the alterations that have taken place in these periods in the destructive power of fire-arms, the increased proportion of severe wounds, the celerity in movements and combination of troops, it seems not remarkable that frequent revision of ambulance *matériel* and administration should be required. There was never a time when more attention was paid than at present to the improvement of the destructive implements of war, and the most effective methods of employing

them,¹ and it is assuredly of pressing necessity that corresponding efforts should be made for the abridgment or mitigation of the sufferings and preservation of the lives of those exposed to such formidable means of aggression. For the interests of the sick and wounded are not alone involved in the efficiency with which the ambulance service is performed. The strategic plans of the commander are promoted or thwarted according as the work is done well or ill; and, above all, the spirit of the soldiers, their tone of feeling and confidence in time of danger, is much affected by their estimate of the provision made for their succor, should they be disabled in action. A veteran soldier, Marshal Bugeaud, after his African victories, declared that "the courage of the French troops would not perhaps have sufficed for the conquest of Algeria, if we had not been able to save the sick and wounded from the Arabs." It is not to be supposed that any neglect in providing for the comfort of sick and wounded men will be without depressing influence on the *morale* of troops of our army employed in Indian hostilities, and inspired with a traditional dread of the tortures that await them should they fall captives to their savage opponents.

The introduction of measures tending to the establishment of an ambulance system in the United States Army is of recent date;² yet it has been acknowledged by the most competent foreign authorities,³ that toward the close of the late war our sanitary field service had attained a thorough organization; and, particularly, that the difficult problem of the speedy and comfortable transport of the wounded from the battle-fields had been dealt with creditably, in the face of great obstacles. It would be deplorable should the efficiency of our ambulance service even relatively retrograde; but it is not to be expected that it can be kept up to the standard attained by the great military powers without constant efforts to improve the equipment, both in providing against the causes of failure revealed by experience, and by devising expedients for unusual exigencies.

Fortunately, progress in the improvement of the equipment provided for the ambulance⁴ service tends to simplicity rather than complexity. The costliness of maintaining, in time of peace, establishments required only in time of war, is an argument often urged against all branches of the military service, which, whatever its relevancy to armaments of war in general, has little validity as applied to the ambulance service. The greater part of its material can be utilized in time of peace; its necessary outfit need not be large or extravagantly expensive. But it is of the last importance, as long as the necessity of standing armies is accepted, that the sanitary appliances furnished should be the best of their kind, that, when an emergency arises, there may not be a lavish outlay for unserviceable material, nor avoidable suffering from the want of suitable equipment. The material required in a complete system of army hospital transport may be classified as: 1, stretchers or litters⁵ carried by men; 2, litters wheeled by men; 3, conveyances borne by animals (litters, cacolets); 4, conveyances drawn by animals (ambulance wagons). Moreover, although its appliances need not be kept on hand, there should be a matured system for the transport of sick and wounded by railway and by water, defining all details, that, in view of an impending war, the requisite resources may be promptly accumulated. When more attention has been

¹ Although, in the late war, the troops were armed, for the most part, with muzzle-loading muskets and smooth-bore cannon, our present inferiority in ordnance is not willingly conceded; but it is held that, theoretically at least, our improvements in gunnery keep pace with those of other nations.

² During the war of the first French republic, in 1796, LARREY and PERCY introduced plans for providing primary surgical aid for those wounded in battle, styled by one *ambulance volante*, and by the other *chirurgie de bataille*. As M. LEGUEST remarks (*Traité de Chir. d'Armée*, 1863, p. 979), they were the first organizers of the ambulance systems now employed, with the modifications suggested by time and experience, in all civilized armies. In the United States, while efficient measures of giving surgical help to the combatants were not altogether neglected in the War of 1812, and the campaigns in Florida and Mexico, the first attempt to introduce a regular ambulance system dates from the assembling of a Board convened October 18, 1859. In March, 1864, Congress enacted a bill for the uniform ambulance system for the armies then in the field.

³ LONGMORE (T.) (*Encyc. Britan.*, 9th ed., 1875, Vol. I, p. 665): "In the armies of the United States during the late great civil war, the ambulance system attained a very complete organization." The two-horse "Wheeling" ambulance wagon may be regarded as a model on which most of the recent attempts to devise an improved form of ambulance vehicle have been based. The HALSTEAD folding stretcher has been pronounced by Professor GURLT, of Berlin, an almost ideal stretcher, "if it only had a head-rest." HARRIS's method of suspending litters by rubber rings; SMITH's and HODGES's wire-suspension splints, and many minor appliances devised in this country for the improvement of the field sanitary service, have been commended and adopted abroad.

⁴ Ambulance is a term first applied to the French "ambulance" (*hôpital ambulant*), derived from the Latin *ambulare*, to move from place to place. As defined by LITTRE (*Dict. de la Langue Française*, 1873, P. I, p. 125), they are "temporary hospital establishments, organized near the divisions of an army, to follow their movements and to assure early succor to the wounded." Surgeon-General LONGMORE remarks (*Encyc. Britan.*, 9th ed., 1875, T. I, p. 665) that "the term is not unfrequently misapplied in common speech in England to the *ambulance wagons* or other conveyances by which the wounded are carried from the field to the ambulances hospitals;" and this abuse of the term is almost universal in the United States.

⁵ Litter, *Lectica* (from *lectus*, bed), according to REE's *Cyclopædia*, Vol. XXII, a kind of vehicle borne upon shafts, anciently esteemed the most easy and genteel way of carriage. PLINY calls the litter the traveller's chamber. It was much in use among the Romans, among whom it was borne by slaves kept for that purpose; as it still continues to be in the East, where it is called a *palanquin*. The invention of litters, according to CICERO, was owing to the kings of Bithynia. In the time of TIBERIUS they were become very frequent at Rome, as appears from SENECA. Horse-litters were much used in Europe prior to the introduction of coaches.

paid to the subject, it is not improbable that the hand-stretcher¹ (*brancard*, *Tragebahre*) may be so perfected as to serve as the uniform means of support in almost all military exigencies, for patients who require transport in a recumbent position. Eventually, it will probably be so constructed as to answer not only as a litter to be carried by men, but as the permanent couch for the soldier from the moment he is disabled until he reaches a fixed hospital, having such adjustments that it may be placed on wheels and drawn by men, or be carried by pack-animals,² or laid on springs or swung in special ambulance wagons, supply wagons, or other wheeled vehicles drawn by animals, or transported by rail or on water. The difficulty of adapting any appliance to various uses without sacrificing some things desirable in each, is obvious; but the importance, in army organization, of uniformity in equipment is so imperious that I cannot doubt that, ultimately, the hand-stretcher, so adjusted as to be readily combined with the various means of transport, will come to be regarded as an implement as essential in the sanitary outfit as the musket and spade in military operations. Notwithstanding the many improvements of late years, the hospital transport service is still generally esteemed the least perfected of any branch of the military organization for campaigning.³ And it must be admitted that the imperfect state of the arrangements for this service becomes painfully apparent when troops are employed remote from railway or water transportation, and especially when they are serving in regions impracticable for wheeled vehicles, where the sick and wounded must be *carried*, either by men or quadrupeds.

Various beasts of burthen have been used for transporting disabled men, and, in a systematic disquisition on the subject, it would be proper to relate how each has been found useful under certain circumstances, and to describe the conveyances most appropriate for them to carry. But, in our army, mules and horses are exclusively employed as pack-animals;⁴ and attention may be here restricted to the conveyance of disabled men by them. The special purpose of this report is to record recent observations of medical officers on the practical working of horse and mule litters over considerable distances in difficult country; but, incidentally, former experiences on the subject will be recalled, the methods practised in other armies adverted to, and such reference made, as space will admit, to the utilization of other quadrupeds for sick transport, to different plans of packing, and to other information having a practical bearing on the subject.

In the Revolutionary War, and in the war with the mother country in 1812-13, our armies were unprovided with any ambulance system.⁵ During the hostilities against the Seminole Indians, in Florida, however, in 1835-38, it appears that the wounded were methodically transported for long distances, by special ambulance wagons or by horse-litters, and that the medical director of the troops, the now venerable Brigadier-General Richard S. Satterlee, organized the *personnel* as well as the *matériel* of the medical field-service as systematically and effectively as the desultory

¹ *Stretchers* appear to derive their name, as Professor LONGMORE remarks (*op. cit.*, p. 115) "from the fact of the sustaining canvas being stretched within a frame." *Brancard*, the French term, is derived from the two poles (*branches*) between which the supporting canvas is held. This is M. LITTRE's etymology; and Baron PERCY states that the word was formerly written *branchard*. *Tragebahre*, the German term, is derived from *tragen* (to carry), and *Bahre*, from the Anglo-Saxon *baer*, English *bier*.

² A plan by which patients supported on hand-stretchers were successfully carried on the backs of the trained mules the French took with them to Mexico, in 1864, will be hereafter described.

³ M. L. LEGOUËST, professor of surgery at Val-de-Grace, in the edition of his classic *Traité de Chirurgie d'Armée*, published after his experience in the Franco-German War of 1870-71, concludes that: "the removal of the wounded from the battle-field and their transport to the ambulance stations is the most defective part of the army medical field service" (*op. cit.*, 6d. 1872, p. 779). Surgeon-General T. LONGMORE, professor of surgery at the army medical school at Netley, declares (*Treatise of the Transport of Sick and Wounded Troops*, 1869, p. 1) that "the established arrangements for this service are generally regarded . . . as the most defective part of military organization, as they are certainly of the medical departmental organization in armies."

⁴ Horses, mules, asses, oxen, camels, llamas, and elephants have been used for transporting wounded. The experiment of using camels as a means of transport in the desert regions of Texas and New Mexico, introduced, I believe, through the efforts of the Egyptian traveller G. R. GLIDDON and of Colonel G. H. CROSMAN, Assistant Quartermaster General, was in a fair way of proving a valuable addition to the means of transport in our army. The animals thrived and multiplied, and rendered good service. At the outbreak of the late war the herds were dispersed. It has been stated, but I am unable to verify the report, that, about this time, most of these animals were sold to circus managers or farmers by persons responsible for public property. There were still one or two camels rendering good services at posts in Arizona as late as 1870. No attempt to renew the promising experiment of acclimating the camel and employing it for army transport has been made since the war.

⁵ "The origin of the ambulance system which now prevails in all civilized armies, though variously modified among them in particular details, only dates from the last decade of the last century" (LONGMORE, *Encyc. Britan.*, 9th ed., 1875, Vol. I, p. 663). Before then, wounded soldiers were either carried to the rear by comrades, or were left exposed and unheeded until the fighting was over. Surgical assistance often reached the field only on the day after the battle or even later, when it was of no avail to a large proportion of the wounded. It was in 1796, during the Italian campaigns (*Lodi*, *Areola*, *Rivoli*), that the illustrious LARREY organized his system of *ambulance volantes*, and PERCY soon afterward introduced a somewhat similar establishment, with a corps of *brancardiers* or stretcher-bearers (*Mém. de Chir. Mil. et Campagnes* de D. J. LARREY, 1812, T. I, p. 150). NAPOLEON I warmly sustained LARREY in his endeavors to perfect the new system of immediate aid to the wounded in battle. In like manner, during the late war in this country, General GRANT showed a keen solicitude in the safe transport of the wounded, always maintaining intimate relations with the medical officer directing that service, and promoting his plans. Before Petersburg he personally supervised experiments with the methods proposed by LANGER and others for fitting up the emptied carriages of the supply train for the comfortable removal of the sick and wounded.

nature of the campaign would allow. In a report to the Surgeon General, dated Fort Brook, Tampa Bay, Florida, January 5, 1838, Dr. Satterlee described the measures taken for the aid of the wounded after the engagement at O-kee-cho-bee:¹

"SIR: I have the honor to inform you that the brigade to which I am attached as Medical Director has had a very severe engagement with the Mickasuckie and Seminole Indians, about one hundred and fifty miles from this place, near a lake called O-kee-cho-bee; it took place on the twenty-fifth ultimo, and lasted nearly two hours, and resulted in the total defeat of the Indians, but with great loss to our troops in killed and wounded.¹ Under the circumstances, as we had no permanent hospital nearer than this, and as the troops must, from the nature of the country, retire from it long before the wounded could recover, I deemed it proper to bring them immediately to this place. I arrived with them last evening, and have now the satisfaction to say that they are in comfortable quarters. I found the ambulances very serviceable, but as some of the wounded could not be transported in them on account of the roughness of the road, between thirty and forty of them were brought, a part of the way, on litters between two horses. This is a very comfortable means of transportation, but difficult on account of the number of men and horses required. I have requested the quartermaster to have twenty litters constructed here, except the poles, which I think can be obtained in the woods. We were obliged to use blankets, and raw-hides of the cattle which we found on our way, but the length of time taken to construct them, together with the want of proper tools, and at a time when the medical officers with me (Assistant Surgeons McLaren and Simpson), as well as myself, were fully occupied night and day with the wounded, it was found very difficult to construct them; this is the reason why I wish them to be on hand and ready for any emergency that may occur. * * *

In the war with Mexico, the wounded were transported mainly in wheeled vehicles; but Colonel G. E. Cooper has informed me of one instance, at least, in which a two-horse litter was used for

sick-transport for a long distance.² This litter, and those used by Medical Director Satterlee are not specifically described; but were probably similar to that referred to and figured by Inspector General R. B. Marcy, in his instructive handbook for travellers on overland expeditions to the Pacific coast.³ This is a very ancient form of litter, often employed prior to the introduction of coaches, in the XVI century, for conveying people

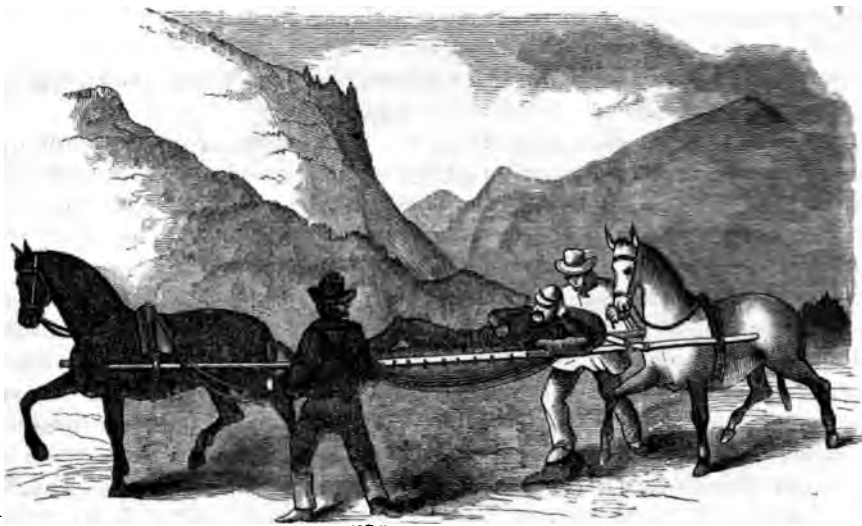


FIG. 1.—Two-horse litter. [After MARCY.]

of consequence, or for the carriage of sick persons. I take the liberty of copying his illustration of the mode of improvising this appliance and adapting it to the exigencies of frontier life.

"Should a party travelling with pack-animals, and without ambulances or wagons, have one of its members wounded or taken so sick as to be unable to walk or ride on horseback, a litter may be constructed by taking two poles about twenty feet in length, uniting them by two sticks three feet long lashed across the centre at six feet apart, and stretching a piece of stout canvas, a blanket, or hide between them to form the bed. Two steady horses or mules are then selected, placed between the poles in the front and rear of the litter, and the ends of the poles made fast to the sides of the animals either by attachment to the stirrups or to the ends of straps secured over their backs. The patient may then be placed upon the litter, and is ready for the march. The elasticity of the long poles gives an easy motion to the conveyance and makes this method of locomotion much more comfortable than might be expected."—[*The Prairie Traveler*, p. 150.]

¹ After the engagement at O-kee-cho-bee, December 25, 1837, the commanding officer, Colonel ZACHARY TAYLOR, in his official report, referred "with the most pleasing and grateful recollections" to "the attention and ability displayed by Surgeon SATTERLEE, Medical Director," and his assistants, "in ministering to the wounded," as well as to "their uniform kindness to them on all occasions."

² "I have never seen a horse-litter used for transporting sick or wounded, save in one instance, which was in the case of an officer who was carried from the city of Mexico to Vera Cruz in one; and of this I have but little recollection, except that there were two horses—one in the front of the litter and the other behind it,—and that the litter was supported by shafts extending from the front and rear, to which the horses or mules were harnessed. The officer was, if my memory fails me not, Capt. WALKER, 6th U. S. Infantry. Not having had anything to do with the getting up of the litter, and having seen it but once as it passed me on the road, I cannot give any reliable description of its construction."—*Extract from a letter of Dr. COOPER dated Point San José, California, January 20, 1877.*

³ *The Prairie Traveler, a Handbook for Overland Expeditions, etc.* By RANDOLPH B. MARCY, Captain, U. S. Army, New York, 1859, p. 150.

Dr. Satterlee's report from Florida is the earliest mention I have found of any scheme of ambulance administration and equipment in the field service of the United States Army.

During the Florida campaign, Captain H. L. Thistle, of the Louisiana volunteers, devised a single-litter horse conveyance, designed for the transport of wounded men through the narrowest defiles, or over the most encumbered and difficult ground. In August, 1836, the inventor proposed to the Quartermaster Department to furnish fifty sets of this appliance, the litter, saddle, and other appurtenances complete, at fifty dollars a set. In January, 1837, this contrivance was patented.¹ The adjacent wood-cut is copied from the drawing filed with the application of the patentee. The specifications are missing. Old officials at the War Department inform me that they remember seeing, in Washington, horses equipped with these litters under inspection; but to what extent, if any, they were issued to the troops, or how far they were tested in actual service, I have been unable to ascertain.²

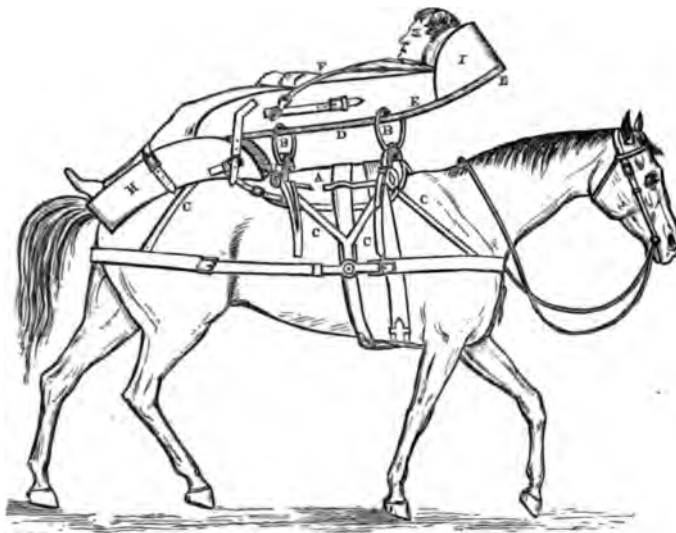


FIG. 2.—THISTLE'S single-litter for horse or mule.

In March, 1852, in an expedition from Fort Conrad, New Mexico, against the Apache Indians, Assistant Surgeon Lyman H. Stone, U. S. A., transported, for a considerable distance, several wounded men on two-horse litters. The question of suitable transport for the sick and wounded appears henceforward to have been a subject of solicitude in the army medical department. In 1858, various models of ambulance wheeled vehicles were constructed, and in October, 1859, a Board was convened to determine their relative merits.³ The Board soon requested and received authority to examine the whole subject of hospital transport. Besides various recommendations regarding the kind of vehicles suitable for the conveyance of patients and of supplies, the Board advised that *two-horse litters* should be constructed and issued to the frontier posts. This recommendation was approved, and the specifications for the construction of such litters were incorporated in the Revised Regulations for the Army. The form of horse-litter recommended appears to have been derived from experiences in Florida and Mexico. It is illustrated in the next cut (FIG. 3). A supply of such litters were distributed to the western posts. The weight of the sample deposited

¹ Consult *Subject-matter Index of Patents for Inventions, issued by the United States Patent Office, Washington, 1874, Vol. III, p. 1231, Patent No. 112.*

² Several officers of distinction who served in the Florida campaign testify to the value of Captain THISTLE'S horse-litter. Major JOHN MOUNTFORT, U. S. Artillery, wrote from New Orleans June 18, 1836: "I have examined your single horse-litter and it affords me great pleasure to say that, for conveying wounded or sick men from the field, it certainly must be considered far superior to the two-horse litter generally used; and as it can always answer for a common pack-saddle, I regard it as all-important for our Indian campaigns, and hope the War Department will adopt it for our service." PERCIVAL F. SMITH, in a letter dated June 20, 1836, states: "Captain H. THISTLE, who served the last campaign in Florida in the regiment of Louisiana volunteers, has invented a saddle or litter for sick or wounded men, which, as far as my experience permits me to say, is the best thing of the kind yet proposed. The want of such a conveyance for the wounded embarrasses the movement of all kinds of troops in that country, where there are no fortifications or depots at which they can be left; and the best plan of a campaign may fail of success from the unforeseen accumulation of sick or wounded without the means of their transportation, and in a warfare where they cannot be abandoned. This saddle of Captain THISTLE obviates the difficulty, for it may be adjusted to a pack-saddle tree and the animal be packed when not carrying any one." Dr. C. A. LUZENBERG, writing at the same place and date, took "pleasure in commending the ingenious saddle constructed by Captain THISTLE." He had "enjoyed ample opportunities of examining various contrivances for similar purposes in use in Europe; but none so well calculated to meet the exigencies that always accompanied Indian warfare as the one for which Captain Thistle claims originality."

³ The Board was convened by S. O. 195, War Department, A. G. O., October 18, 1859. The order states that models of ambulance conveyances having been constructed according to the most approved plans, in accordance with General Order No. 1, A. G. O., 1859, Surgeons C. A. FINLEY, R. S. SATTERLEE, C. S. TRIPLEK, J. M. CUYLER, and Assistant Surgeon R. H. COOLIDGE, will assemble at Washington, November 1, 1859, to examine and select the most suitable models, and to make such suggestions as it may deem practical and expedient, and also to perform any other duties connected with the subject that should be referred to it by the War Department. At the fifth meeting, November 5, 1859, the Board after disapproving of all the model ambulance vehicles presented, submitted a statement to the Secretary of War, J. B. FLOYD, declaring that: "A complete ambulance system is very desirable and necessary for the hospital department in the field, and therefore asking that authority be given to the Board to consider and report on an ambulance system which will meet the exigencies of the service." At its fifteenth meeting, November 17, 1859, the Board decided that troops in the field should be furnished with ambulance transportation at the rate of forty men per thousand, provision to be made for twenty recumbent patients and twenty in the sitting posture. At the seventeenth meeting, November 19, 1859, the Board passed a resolution for the provision of two-horse litters, which was approved and adopted textually as paragraph 1292 of the Army Regulations (ed. of 1861), as cited above.

in the Army Medical Museum is eighty-eight pounds.¹ I cannot learn that these litters were used during the late war; but in hostilities with Indians that have occurred since its termination, as in the Modoc campaign of 1873, they were sometimes carried into the field, and, in the last two years, improvised litters, constructed on the same general plan, have been extensively employed; and it is surprising that they have been regarded in some quarters as a novel device.²

In the Revised Regulations for the Army of the United States for 1861, Paragraph 1298 reads: "Horse-litters may be prepared and furnished to posts whence they may be required for service on ground not admitting the employment of two-wheeled carriages; said litters to be composed of a

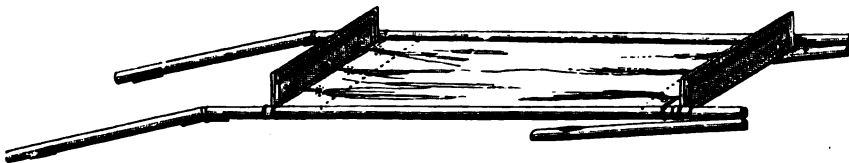


FIG. 3.—United States Army regulation two-horse-litter. [From a sample in the Army Medical Museum.]

canvas bed similar to the present stretcher, and of two poles each sixteen feet long, to be made in sections, with head and foot pieces constructed to act as stretchers to keep the

poles apart." Reports printed further on fully explain the mode of constructing extemporaneously and of using this form of two-horse litter;³ but before introducing them it is proper, in chronological order, to allude to some other forms of sick-transport on pack-animals.

During the progress of the late war in this country, a number of persons, actuated by motives of patriotism, humanity, or interest, devised and brought to the notice of the War Department forms of conveyance for the sick and wounded, in localities impracticable for wheeled vehicles, that were represented as improvements upon existing patterns. Several of these were apparently suggested by the descriptions of Delafield⁴ and McClellan⁵ of the horse litters and cacolets they had observed in the Crimea. In October, 1861, W. C. H. Waddell forwarded to Secretary Cameron a proposal to construct cacolets and litters for army use, accompanied by drawings (FIGS. 7, 8), copied from Delafield's report, and suggested some trivial modifications. In November, 1861, Mr. G. Kohler offered to furnish mule-litters and chairs of patterns imitated from those used in the Crimea. In July, 1862, three hundred of these litters were purchased. In April, 1862, Surgeon

¹ The litter deposited in the Army Medical Museum is numbered 2457, of Section I. (See *Catalogue of Surgical Section*, 1866, p. 625.) It weighs 88 pounds. The poles are of ash, cylindrical, and 2½ inches in diameter and 16 feet long, divided into sections, united by strong wrought-iron strap-hinges. The leading sections are 4½ feet; the middle, 8 feet; and the rear, 3½ feet in length. The side poles are kept apart by traverses of the same calibre, 25 inches in length, with ½-inch iron collars, 1½ inch wide. Each traverse is supplied with 5 iron pins to which the sacking-bottom is corded, and is surmounted by a head- or foot-board of half-inch stuff, 8 inches high, and protected by an iron rim. The collars of the traverses rest against iron shoulders, 12 inches from either end of the middle sections. The strong canvas sacking-bottom is 6 feet by 2 feet 9 inches. The side poles are inserted through a wide hem. The end sections are furnished with heavy straps and girths.

² A palanquin, or two-horse litter, as used in the sixteenth century, is figured in a wood-cut in CHARLES KNIGHT'S *Old England*, compiled from



FIG. 4.—Two-horse litter of the XVI century.

several pictures in BRAUN'S *Civitates Orbis Terrarum*, 1584. In FIG. 4 the portion of the cut representing the horse-litter is copied. In *Shifts and Expedients of Camp Life*, by LORD and BAINES (London, 1871, p. 687), there is a suggestion of an arrangement that "might, under favorable circumstances, be made available for the carriage of a wounded man," with a cut (FIG. 5) of the appliance for suspending the patient either in a semi-recumbent or prone position.

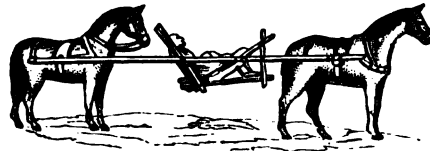


FIG. 5.—LORD and BAINES'S horse-litter.

A conveyance much resembling this is used, according to Professor LONGMOORE, in some parts of the East Indies, where it is called a "Tukta-rewan."

³ Professor T. LONGMOORE, in his excellent *Treatise on the Transport of Sick and Wounded Troops*, London, 1869, p. 292, thus refers to this form of litter: "It is necessary to notice another form of sick-transport litter issued for use in the early part of the late war in the United States, in which, instead of two litters being suspended across one horse or mule, one litter was suspended between two horses. This is a very ancient form of litter in Europe. Frequent notices of it occur, showing its common use on occasions of state and ceremony, as well as its employment for the carriage of sick persons, in the records of our own country prior to the introduction of coaches. It seems curious that its use should have been revived in modern times in America." In a note it is added: "This form of litter is referred to as late as the reign of CHARLES the 2d. A quotation introduced into the first volume of Knight's *London*, pp. 24 and 25, mentions that Major-General SKIPTON, coming in a horse-litter to London when wounded, as he passed by the brew-house near St. John street, a fierce mastiff flew at one of the horses and held him so fast that the horse grew mad as a mad dog; the soldiers were so amazed that none had the wit to shoot the mastiff; but the horse-litter, borne between the two horses, tossed the Major-General like a dog in a blanket."

⁴ *Report of the Secretary of War, communicating the Report of Captain GEORGE B. MCCLELLAN (First Regiment United States Cavalry), one of the Officers sent to the Seat of War in Europe in 1855 and 1856.* Washington, 1857.

⁵ *Report on the Art of War in Europe in 1854, 1855, and 1856, by Major RICHARD DELAFIELD, Corps of Engineers, from his Notes and Observations made as a Member of a "Military Commission to the Theater of War in Europe" under the orders of the Hon. Jefferson Davis, Secretary of War* Washington, 1860.

Glover Perin, U. S. A., and Assistant Surgeon Benjamin Howard, U. S. A., reported to Surgeon-General C. A. Finley the results of their inspection of cacolets and litters, devised by Mr. Charles Proal, of Louisville.¹ Newspaper descriptions, almost textually quoted from Delafield's report, with figures of these appliances, were transmitted. Mr. Proal claimed to have improved upon the French patterns by diminishing the weight and cost of construction. Messrs. Lawrence, Bradley & Pardee, of New Haven, Connecticut, in 1861, applied for a patent for a cacolet, of cumbrous pattern, weighing 131 pounds. The chairs could not be detached from the saddle. A sample, figured in the adjoining wood-cut (FIG. 6), was sent, in 1867, to the Army Medical Museum, and is numbered 824 in Section VI. It combines in an unusual degree the undesirable qualities of weight, weakness, and inconvenience. On September 25, 1862, a board of officers of the quartermaster department examined cacolets submitted by Dr. Slade Davis, and reported² that, as compared with others that had been purchased for

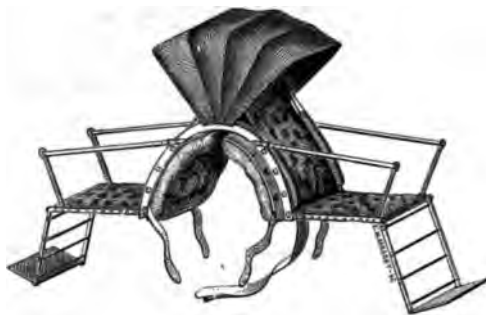


FIG. 6.—Cacolet of Lawrence, Bradley & Pardee. Spec. 824, SECT. VI, A. M. M.

the service, the only advantage of this form of cacolet was its lightness. It was thought that those already on hand were as light as was consistent with the requisite degree of strength. Mr. E. P. Woodcock,³ of New York, in November, 1863, patented a pack-saddle with wooden outriggers from the pommel and cantle for the suspension of litters. By securing litters to the projecting parts by straps, and protecting the side of the animal by pads, it was designed to carry two patients in the recumbent position. This contrivance was exhibited by the United States Sanitary Commission at the Exposition in Paris in 1867, but met with no more approval abroad than at home. Mr. J. Jones,⁴ of New York, in December, 1862, proposed to the Surgeon General of the Army a mule-litter for carrying two persons either in a sitting or recumbent position, the litters being designed to serve also as efficient hand-stretchers or hospital-beds. The "exceeding lightness, strength, and simplicity" of these conveyances were insisted on. The saddle with two litters, girths, bridle, and other appurtenances weighed only 62 pounds, and could probably be reduced to 60 pounds. In September, 1863, a board of medical officers was convened in Washington to examine into the merits of an "adjustable ambulance and pack-saddle," submitted by Spencer, Nichols & Co. Lightness, strength, simplicity, efficiency, adjustability, and cheapness were the merits claimed for this contrivance.⁵ Shortly afterward, December 1, 1863, another medical board assembled in Washington, to inspect and report on a mule-litter submitted by Messrs. Pomeroy & Co., which

¹ Extract from a communication to Surgeon-General C. A. FINLEY, by Surgeon G. PERIN and Assistant Surgeon B. HOWARD, dated Louisville, April 2, 1862: "The undersigned would respectfully state that Mr. Charles Proal, of this city, has submitted to our inspection a saddle-ambulance, which has been fairly tested by us in the open field. Its chief excellencies, compared with other saddle-ambulances, are that it is lighter, is more easily adjusted, and combines both the litter and the chair, both of which can be packed away in a very small compass when the pack-saddle to which they belong is required for other purposes. The weight of the entire ambulance, with saddle, etc., is about seventy-four pounds, that of the French being about one hundred and forty-two pounds. The mode of adjustment is such that two litters, two chairs, or one chair and one litter, can be used at the same time, at discretion, each of which may be affixed to, or detached from, the saddle, while the patient remains undisturbed. The harness appears to be very complete, the breeching and breast-band preventing motion backward or forward, while the surcingle, by being attached to the bottom of each chair or litter, prevents either undue oscillation, or shifting, which would be otherwise consequent upon any inequality in the weight of the two patients being carried. * * The price of the ambulance and appurtenances completed is about fifty dollars."

² A Board of officers, consisting of Colonel D. H. RUCKER, Quartermaster, Captain J. J. DANA, A. Q. M., Captain E. E. CAMP, A. Q. M., was convened at Washington, September 25, 1862, to "examine a cacolet to be presented for inspection by Dr. SLADE DAVIS, and to report its opinion of the cacolet as compared with other patterns which have been purchased for the service." The Board reported, that "in their opinion the cacolet presented by Dr. SLADE DAVIS possessed an advantage over those furnished by Mr. KOHLER (three hundred in number), all of which are now on hand, in lightness only. Those made by Mr. KOHLER are constructed in a strong and desirable manner, and are as light as is consistent with the requisite degree of strength. No call has yet been made either for those first purchased or for those furnished by Mr. KOHLER, which cost \$21,000. We would not recommend the purchase of an additional number from any source."

³ Compare LONGMORE (*Treatise on the Transport of Sick and Wounded, etc., op. cit.*, p. 290), *Subject-Matter Index of Patents for Inventions*, Washington, 1874, Vol. III, p. 1232, and SÉBURIER (*Conférences Internationales des Sociétés aux Blessés Militaires des Armées de Terre et de Mer tenues à Paris en 1867*, T. I, p. 47).

⁴ MSS. Records of War Department for 1852.

⁵ The Board, consisting of Surgeon T. H. BACHE, U. S. V., Surgeon C. ALLEY, U. S. V., and Assistant Surgeon W. MOSS, U. S. V., reported, September 16, 1863, 1. That the cacolets weighed 55½ lbs., and the saddle-girths and other equipment 38 lbs. 2. The saddle-tree was jointed, so that by turning screws it could be adapted to animals of different sizes. 3. As to simplicity, the saddle was provided with projecting crane-like supports of hickory covered with raw-hide, which were connected either with a flat framework of hickory, for packs, or with litters for patients. 4. As to strength, the saddle easily sustained two barrels of flour; but, when two soldiers, one of them a heavy man, mounted on the litters, there was "a slight yielding;" but the Board considered the litters "strong enough to bear any load that a horse or mule could carry." Finally, the Board considered the pattern submitted as "comfortable as such a conveyance can be made."

was found to possess some good and some objectionable features.¹ In addition to these essays in invention, cacolets and litters were submitted to the Quartermaster's Department, that purported



FIG. 7.—British Crimean mule-litter. [After WEIR.]

to be of utility. Early in the war, however, probably as early as May, 1861, the Quartermaster's Department had purchased a number of cacolets and mule-litters of the patterns used in the



FIG. 8.—British Crimean cacolet. [After WEIR.]

to be constructed simply in accordance with drawings in General Delafield's report.² August 20, 1861, Messrs. Lutz and Bridget, harness-makers, furnished twenty such sets with pack-saddles and harness. These drawings, which are copied, of a reduced size, in FIGS. 7 and 8, though prepared by so distinguished an artist as Professor Weir, do not accurately represent the mechanical details of either the French or British Crimean litters and cacolets, and the ambulance equipments, made in imitation of them, did not prove in imitation of them, did not prove

The Quartermaster General has remarked that these horses and mules were gradually appropriated as draft animals, and that the litters and cacolets were, for the most part, condemned as unserviceable. The French litters and cacolets were what is known as the old pattern, such as the French used in Algeria and the Crimea. They are figured in my surgical report in *Circular 6*, S. G. O., 1865, at page 82. Surgeon-General Longmore correctly observes (*op. cit.*, p. 291), that "the same drawings may also be seen in Chapter XX of M. Legouest's *Traité de Chirurgie d'Armée*, Paris, 1863, pp. 968-9. I ventured to copy the drawings because they well represented the iden-

¹ The Board consisted of Medical Inspector J. M. CUYLER, U. S. A., Surgeon O. A. JUDSON, U. S. V., and Assistant Surgeon C. A. MCCALL, U. S. A. The report is unaccompanied by a description or drawing of the conveyance, but states that it was simple in construction, with unusual capacity for providing for the comfortable carriage of two wounded men. Some modifications were suggested, such as strengthening the attachments of the litters by substituting chains for straps; of supplying means for rendering their framework rigid so that they might be used temporarily as stretchers; of arranging that they might be detached from the saddle; of having rings and hooks for attaching necessary articles to the pack-saddle, and particularly a vessel for water. The Board was unwilling to decisively approve of the conveyance until these alterations had been effected, and a trial in actual service had been successfully made.

² DELAFIELD (R.) (*Report on the Art of War in Europe*, 4to, Washington, 1860, p. 73) makes the following observations on mule-litters and cacolets: "The requisites for an ambulance should be such as to adapt it to the battle-field, among the dead, wounded, and dying; in plowed fields, on hill-tops, mountain slopes, in siege batteries and trenches, and a variety of places inaccessible to wheel carriages, of which woods, thick brush, and rocky ground are frequently the localities most obstinately defended, and where most soldiers are left for the care of the surgeons. These difficulties were felt in a great degree by all the armies allied against Russia in the siege of Sebastopol, and the consequence was that the English, French, and Sardinian armies adopted finally, in part or altogether, pack-mules, carrying litters or chairs. The careful and sure-footed mule can wind its way over any road or trail, among the dead, dying, and wounded, on any battle-field, as well as in the trench and siege battery. It required but suitable arrangements to support the wounded from the mule's or horse's back to attain the desired object, and this the allied armies finally accomplished and put in practice. The merit of the plan renders it worthy our consideration, particularly so in our Rocky Mountain and other distant expeditions." Further on he remarks: * * "I witnessed the transport of one hundred and ninety-six sick and wounded French soldiers, with their arms, accoutrements, and knapsacks, on the route from the Tchernaya to Kamiesch Bay, on these litters and chairs. Fifty-two of them were on twenty-six mules in the horizontal litters, and one hundred and forty-four seated in chairs on seventy-two other mules. A driver was provided for every two mules or four wounded men. The appearances, with such an examination as I gave the whole equipment, were so favorable as to recommend it for trial in our service. To make the system better understood, I annex two additional figures (FIGS. 7 and 8) showing the animal, the equipment, and position of the soldier, for which compilation and drawing I am indebted to Professor WEIR."

tical cacolets and litters issued in our army, and through an inadvertence which must be conceded to be unusual in me, I neglected to acknowledge my indebtedness to my honored friend and master. I trust this explanation will convince him and every one that I had no surreptitious design in using the cuts. In the mule-litters and cacolets now issued in the French army, there are improvements providing for making the sections of the litter rigid, so that it can be used temporarily as a hand-stretcher, for reduction in weight, and for greater compactness in packing.¹ The mule-chairs and litters now issued by the British Royal Carriage Department are lighter and more convenient than those used in the Crimea. I take the liberty of copying Surgeon-General Longmore's drawings of the cacolet (FIG. 9) and litter (FIG. 10) now employed in the British service.² The only reference I find of the actual employment in battle, during the late War in this country, of horse-litters or cacolets, is made by Professor F. H. Hamilton.³ He mentions that, at the battle of Fair Oaks, May 31, 1862, when he was medical director of the Fourth Army Corps, eight pack-saddles, provided with a litter on one side and a cacolet on the other, were provided as a part of the ambulance outfit of that corps, and were used only on the first day of the battle, proving utterly unserviceable. Notes are found in the War Department records of the transmission, August 26, 1861, of twelve of the mule-litters and cacolets made by Tiffany & Co., to the army in the Shenandoah valley, commanded by General Banks. A supply of litters and cacolets was provided for the advance of the Army of the Potomac from Yorktown toward Richmond in May, 1862. There were forty, at least, in store at White House,⁴ but there were no trained animals to bear them. Moreover, the subordinate quartermasters and medical officers appear generally to have regarded the experiment with little favor. Medical Director Tripler, who, in 1859, in a report on the needs of the ambulance service, had urged the importance of supplying horse-litters to troops serving in regions impracticable for wheeled carriages, made several efforts to secure suitable equipment and proper animals⁵ for this purpose, but without much success. His successor, also, Medical Director Letterman, entertained similar views, in correspondence with the opinions of European authorities; and persevering, though ill-arranged, efforts were made to give the system a fair trial. In July, 1862,



FIG. 9.—British mule-chair or cacolet, open for use and packed for travelling. [After LONGMORE.]

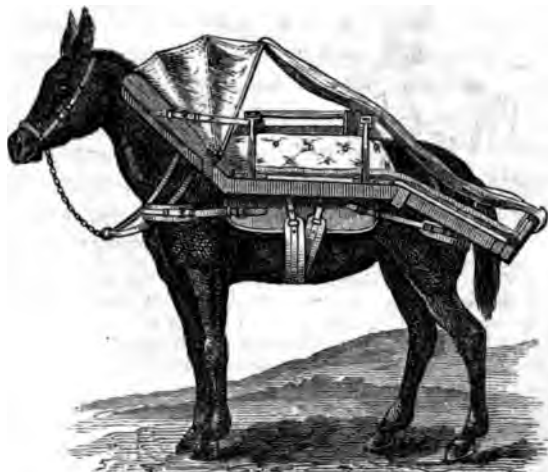


FIG. 10.—British army mule-litter attached to its pack-saddle. [After LONGMORE.]

¹ M. BOUDIN states (*Système d'ambulances des armées française et Anglaise*, 1855, p. 35) that the cacolet weighed something over 19 kilogrammes the pair. The pair in the Army Medical Museum weighs 40 pounds. Including the pack-saddle, Professor LONGMORE says a pair weighed in the Crimea was found to be 89 pounds and 12 ounces.

² The weight of a pair of English litters used in the Crimea was 138 pounds 12 ounces, without the pack-saddle. The present pattern weighs 84 pounds, without bedding or pack-saddle. With the paillasses and pack-saddle the weight is 167 pounds.

³ HAMILTON (F. H.) (*A Treatise on Military Surgery and Hygiene*, 1865, p. 162): "Just before the battle of Fair Oaks, eight were sent to us for the use of the 4th Corps. They were only employed, however, on the first day of the battle. The horses were found to be impatient and restless under them, and six of the eight were soon broken and rendered unfit for use. Mules are better than horses for this purpose; they are not so high, and are less restive under the pressure of heavy weights upon their backs; but even mules require to be trained especially to this kind of service, before they can be rendered useful or safe."

⁴ From a telegraphic order of May 27, 1862, recorded on the files of the War Department, and addressed from the Headquarters of the Army of the Potomac, by Lieutenant-Colonel J. A. HARDIE to Colonel S. VAN VLIET, Q. M., at White House, on the Pamunkey, it appears that a certain number of cacolets were at that depot prior to the battle of Fair Oaks. The dispatch reads: "The commanding General directs that you furnish the forty cacolets at the White House, belonging to the Medical Department, with horses, and report to the Medical Director here the moment they are ready." Doubtless the eight cacolets sent to the Fourth Corps were supplied from this source.

⁵ March 13, 1862, on receiving the papers regarding Mr. Kohler's request for an examination of his litters and cacolets, Medical Director TRIPLER makes the endorsement that: "there are sufficient horse-litters for this army in the possession of the Quartermaster's Department. All we want now is horses or mules properly trained to carry them."

the Surgeon General requested the Quartermaster's Department to provide three hundred litters, and this number was purchased of Mr. G. Kohler.¹ Prior to the battle of Antietam, Medical Director Letterman asked for a supply of mules equipped with cacolets and litters. The Quartermaster's Department had an ample supply of the French patterns,

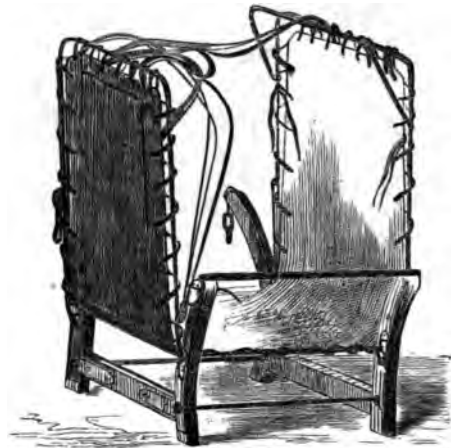


FIG. 11.—French *litière* folded. [After LEGOUÉST.]

which were beyond all question the best that had been devised at that time. But there were no trained animals to bear them, and few, if any, available skilled packers. September 1, 1862, the Surgeon General requested that a hundred mule-litters should be sent to Medical Inspector R. H. Coolidge. A few weeks after the battle of Antietam a hundred and fifty mules were sent to the Army of the Potomac for ambulance service, but they were so unruly that it was

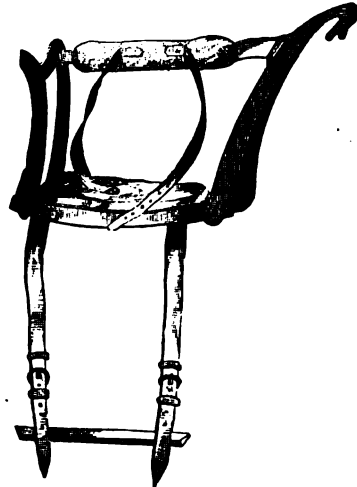


FIG. 12.—French *cacolet* unfolded. [After LEGOUÉST.]

thought unwise to pack them with their equipment, and the litters and cacolets were sent along in wagons, and, as far as can be learned, never found their way to the backs of the mules.² Little could be anticipated from such essays. In November, 1862, the Surgeon General made another requisition for a hundred and fifty mules with drivers, with a view of having them drilled with cacolets in the field, by Dr. Slade Davis; but this, like previous experiments in this direction, proved abortive; and the ambulance material for transport by pack-animals, accumulated at no inconsiderable cost, was never really tested in the field.³ There seems to have been a widespread distrust of the system on the part of officers of the Quartermaster's and the Medical Departments.

¹ June 17, 1862, Colonel RUCKER advises the Quartermaster General that he has advertised for proposals for mule-litters, and that the only proposal received is from Mr. G. KOHLER, and that the litter he proposes to furnish seems to be very high-priced; "it is intricate and cumbersome in construction, and, in my opinion, inferior to those now in Captain DANA's store-house" [the French *cacolet* and *litière*]. July 26, 1862, Surgeon-General HAMMOND states, in reply to a letter from the Quartermaster General concurring in Colonel RUCKER's opinion: * * "The litter presented by Mr. KOHLER has been examined by myself and a board of officers, who agree that it possesses sufficient merit to entitle it to trial in the field. I therefore request that three hundred of the mule-litters presented by Mr. KOHLER be purchased for the use of the army." Quartermaster General MEIGS replies, July 29, 1862, that * * "inasmuch as the Surgeon General adopts and requests that these litters be constructed, though in the opinion of the Quartermaster's Department they are not as good as those already on hand, they will be contracted for under the proposal of Mr. KOHLER. The price bid is understood, as in other cases, to include the whole set, namely, head-stall, harness, saddle, and two litters for each mule." As early as December 9, 1861, this pattern of mule-litter had been reported on by a board convened by General MCCLELLAN, consisting of Col. D. H. RUCKER, Surgeon C. H. LAUB, and Surgeon J. R. SMITH, it is presumed unfavorably, as further action was not had at the time.

² In October, 1862, the Surgeon General again made requisition on the Quartermaster's Department for one hundred and fifty mules provided with mule-litters, to be sent to Dr. JONATHAN LETTERMAN, Medical Director of the Army of the Potomac. In reference to delay in compliance with this requisition, Captain J. J. DANA, A. Q. M., reported, October 17, 1862, as follows: "The order was given by me, October 3d, immediately on its receipt, for one hundred and fifty mules and litters to be made ready for service. At that time we had no mules sufficiently well broken for the purpose. I directed fifty of the best to be taken from the ambulance train, the litters to be fitted upon them, and the mules drilled daily until they were fit to go into the field. On the 9th of October, fifty mules with litters upon them were started for Dr. LETTERMAN. Much difficulty was experienced in getting the mules forward, as they were, many of them, inclined to lie down and were otherwise unruly. Among a lot of mules received on the 10th instant, we found one hundred which were to some extent suitable for the purpose, and were sent forward on the 11th instant, the litters being sent by wagons in order to expedite the matter." October 3, 1862, Quartermaster-General MEIGS, in transmitting this report to Surgeon-General HAMMOND, stated: "I desire respectfully to call your attention to the fact mentioned in the report: that there are a large number of cacolets now in the possession of the Government which appear to have been overlooked by the officers of your department, and to suggest the expediency of directing their availing themselves of them as occasion may arise. General MCCLELLAN issued orders, a year ago, for drill and practice of ambulance men, including, as I understand, the use of the mule-litters, of which, of French and American manufacture, there were then a considerable number provided by the Quartermaster's Department. Those lately purchased from Mr. KOHLER, on the requisition of the Surgeon General, cost \$21,000, and are still in store."

³ "From the papers laid before the Quartermaster General to-day, there appears an expenditure for purchase of cacolets and litters in 1861 and 1862 for the Army, partly upon requisitions from the Surgeon General, partly from orders originating in this office, of over \$20,000. To this, if the cost of animals and use of men, of forage, &c., supplied by this Department for the experiment of introducing these litters and cacolets, it would be found that not less than \$100,000, and probably more has been expended in an experiment which was, so far as information in this office goes, entirely unsuccessful. There never was, to the knowledge of the Quartermaster General, a requisition from any military commander. All the requisitions came from the Surgeon General's office. It is not known to this office that these mule-litters ever were used in service, and the Quartermaster General believes that no wounded man was ever placed upon one of them. While the wheeled ambulances and hand-litters provided for the hospital equipments were in constant and useful use, the litters burdened the trains, and the mules were by the ordinary accidents of service taken for the ambulances and wagons. He believes that no better cacolet or mule-litter will be constructed than the French cacolet and litter, ordered at the beginning of the rebellion; and these, which though in his judgment inferior, were, at a later period, bought at the urgent requisition of the then Surgeon General. He is, therefore, of opinion that any further expenditure by this Department in this line of experiment will be a waste of public money, and he will not, therefore, unless under order of higher authority, expend money or make reports upon any models thus far submitted to him."—*Mem. of QUARTERMASTER GENERAL*, December 23, 1868.

In a letter of March 20, 1863, Surgeon George Suckley, U. S. V., Medical Director of the Eleventh Corps, wrote from the Army of the Potomac, near Fredericksburg, to Surgeon J. H. Brinton, U. S. V., at Washington:

"There are no cacolets in this Corps, and I want none. Three hundred and fifty pounds' weight is too much for a mule's back over rough ground, encumbered by bushes, stones, logs, and ditches. Among trees, cacolets will not answer at all; although used in European services and in Algeria, they have there been employed under some favorable circumstances, either on plains or on open rolling country. Here they would prove, I sincerely believe, only a troublesome and barbarous encumbrance, cruel alike to the wounded and the pack-animals."



FIG. 13.—French litière unfolded. [After LEGOUEST.]

The French patterns, represented in FIGURES 11, 12, and 13, copied from M. Legouest's work, were, like the rest, considered unsuited to the requirements of field service in this country. Scarcely a word in favor of them is to be found in any reports of the medical directors¹ or field surgeons.

Surgeon John Moore, U. S. A., who long served as Medical Director in the Western armies, writes from San Antonio, January 24, 1877, in regard to the use of horse-litters and cacolets: "We had a few of these litters with the armies in the West, but they were very generally left in the depots of supply. I never knew of a single wounded man being carried on a horse-litter; for a man wounded in his arm or anywhere above the waist, was not so badly hurt as to prevent his riding a gentle horse, they are not needed; and for one so badly injured that he is unable to sit without being propped or supported, they are so uncomfortable as soon to become intolerable, and in all such cases where ambulance wagons or wheeled vehicles could not be had, hand-litters were improvised from slender poles cut in the woods and canvas or blankets fastened on them, upon which the wounded man was laid, and the litter either carried by men or by passing the ends of the poles through a kind of stirrup on each side of a horse or mule, an animal being at each end and the wounded man between them. In civilized warfare it rarely happens that men are wounded beyond the reach of our two-horse ambulance wagons, that horse-litters, at least such as I have seen, might well be excluded from the hospital equipment. There only remains, therefore, our Indian campaigns, in which the horse-litter may be utilized. But, unfortunately, the country where this kind of warfare takes place will usually be found so rocky and cut up by deep ravines as to make it impracticable to carry a badly wounded man in one of these horse-litters. Then the hand and horse-litter just referred to must be used, and nothing is better adapted to its construction than the Indian lodge-poles. There is usually little trouble in putting it together. Should it be necessary to carry a man for a long distance, the litter would be greatly improved by stretching over it, instead of canvas or blanket, the fresh hide of an ox, mule, or horse. If any of our litters have been found serviceable during the past year in the expeditions against the Sioux, I should be glad to know which; and also to learn the opinion of the men transported for two or three days in the Yellowstone region. The condition of the animal on which he was carried at the end of two or three days would not be without interest."

The absolute failure of the attempt to introduce, in our army, a system of sick-transport by cacolets and double litters² seems to have been due to defects, possibly insurmountable, in admin-

¹ Surgeon G. PERIN, Medical Director of the Army of the Cumberland, in a letter dated Fort Leavenworth, January 20, 1877, states: "In so far as I can now remember, this method of transporting sick or wounded was never used in any command with which I served. The hand-litter was all that was necessary to convey the wounded to points accessible by the ambulance trains. The only service where the cacolet or horse-litter would be found necessary, in my opinion, is that of scouting, where wagon transportation cannot be taken. I should prefer, for our Indian scouting, to take pieces of canvas about seven feet long by three feet wide, with eyelets six inches apart worked around the edges. These may be lashed over poles procured when needed. The poles can be fastened at one end to a pack-saddle and the other end allowed to drag upon the ground. This is the way the Indians transport their sick and wounded, and ordinarily answers well. In rough, stony grounds I have used litters mounted upon two pack-mules or horses, one being in front and one in rear, with a man to lead each animal." Dr. JOHN H. BRINTON, formerly Surgeon U. S. V., and Medical Director of the Middle Military Department, writes, January 13, 1877: "All that I can remember of the horse and mule-litters is the fact that a number of samples were inspected at the Surgeon General's office by a board appointed for the purpose, and my impression is that a limited number of the foreign models were issued to the brigade of regular cavalry then stationed near Washington. I subsequently enquired of many medical officers how this mode of transportation answered; and, to the best of my recollection, it was always condemned or spoken of as unsatisfactory, and unsuited to the American soldier. I imagine it will be found that very little, if any, real use was made of those horse-litters. As you know, I was present at many battle-fields, and witnessed the employment of almost every sort of transportation; but I am quite sure that I never saw one of these litters used." General J. M. CUTLER, who, as Medical Inspector General, had great opportunities for observation, writes from the headquarters of the Military Division of the Atlantic, January 10, 1877, that with the exception of the inspection at Carver Hospital [see note 1, p. 10, *ante*], in December, 1863, of the mule-litter submitted by Pomeroy & Co., he saw nothing of this mode of transport during the war. Colonel G. E. COOPER, Assistant Medical Purveyor, U. S. A., who was long at the head of the medical administration of the principal Western armies, writes, January 20, 1877, that: "I have never seen a horse-litter used for transporting sick or wounded, save in one instance." [The incident referred to, which occurred in the Mexican War, is noted at page 6, *supra*.] Surgeon JOSEPH B. BROWN, U. S. A., who was long intimately associated with the administration of the medical service of the Western armies, writes, January 19, 1877: "Concerning the use of horse-litters or cacolets in the Western Department, * * I have to state that I can recall no instances of my personal experience at all of the use of such transportation for wounded, for it has been my fortune to have been entirely unprovided with anything of the kind under circumstances and at times when they could have been used."

² Marshal LEROY DE SAINT-ARNAUD, in his *Rapport sur la réorganisation des Equipages Militaires*, Paris, Février, 1852, says: "The use of the mule with a cacolet or litter was first adopted in Algeria. By means of these ingenious equipages, hundreds of wounded, amputated, and sick soldiers have been transported in safety to our base of operations."

istration, and not to demerits of the system. Without efficient animals and packers it was vain to anticipate useful results from the best-contrived appliances. Used with the greatest advantage in Algeria¹ and in the Crimea, the French cacolets and litters were adopted by the British army medical department with satisfactory results. In the Italian war of 1859, they were found serviceable in each of the different armies engaged. They were used, with what results I have not ascertained, in the armies of Spain and Portugal. The Italian Medical Inspector General, Dr. Cortese, reported most favorably of their utility in the rocky defiles and narrow wooded paths of the Tyrol (Fischer). Sent to India during the Sepoy rebellion, and to New Zealand during the Maori war, they proved altogether useless from lack of trained animals to bear them (Longmore). In the Franco-Austrian invasion of Mexico, the French contingent of the expeditionary army, carrying with them their train of pack-mules, used this mode of transport advantageously; whereas the Austrian contingent, relying on animals picked up in the country, derived little benefit from it.² On the whole, it may be asserted that the evidence of the value and importance of mule-litters and cacolets, as a part of the ambulance equipment, is conclusive. They can be packed compactly and easily carried on the march—the mules conveying supplies or doing other field service when not

¹ Marshal BUGEAUD, who served with great credit in his campaigns in the Spanish peninsula, from 1810 to 1814, and afterward commanded in Algeria, concluding in 1837 the treaty of Tafna with Abd-el-Kader, when recalled, in 1847, to command the army of Paris, was the warm advocate of supplying the army with means of transport by pack-animals, regarding the mule-litters and cacolets used in Africa as scarcely susceptible of improvement. He contrasted the efficiency of this mode of transport with what he had observed in Spain, where, for the want of transport suited to the field of operations, whole divisions had sometimes to abandon their wounded on the field. Such neglect, he argued, must produce a most depressing effect upon the troops. Marshal BUGEAUD recommended that the equipment for the transport of wounded of all the cavalry and infantry divisions of the French army should be exactly like that of the army of Africa, and that wheeled ambulance-wagons should be attached only to the reserves. Medical Inspector General HALL considered the merits of the French cacolets and litières,—their general applicability to the circumstances of warfare,—their admitting of the removal of sick and wounded from every description of ground and over every kind of ground where mules and horses can travel,—and the rapidity with which the removal could be effected over roads where wheeled carriages could not travel (*Parliamentary Report upon Hospitals of the British Army in the Crimea*, London, 1855). Colonel BLANE, Assistant Adjutant General for Lord RAGLAX, regarded "the cacolets and litières now in the French service as by far the most perfect system which has yet been devised for the transport of sick and wounded with an army in the field." See LONGBMORE, *op. cit.*, p. 274.

² Dr. J. NEUDÖRFER, the chief medical officer of the Austrian expeditionary force in Mexico, in 1864-5, thus relates (*Handbuch der Kriegschirurgie*, Leipzig, 1867, p. 341) his experience of transport by mule-litters and cacolets: "Those who know these modes of transport only from descriptions and delineations, without personal experience, will be much prepossessed in their favor, as they appear simple, easy of conveyance, and practicable on every ground. We will show, however, that the system is not quite so simple as it appears. We had cacolets made of the French pattern, in the corps workshop at Puebla. The weight was 70 pounds, and could not, without risk to solidity and utility, be reduced to less than 60 pounds. Considering further the weight of the wounded man (with his full equipment, which is not allowed to be abandoned) as amounting to 150 pounds, and finally estimating the equipment of the mule leader, other traps of the wounded man, their victuals, and perhaps a little forage for the mule, as weighing 30 pounds, we have a round total of 400 pounds, to be transported by the mule. Four hundred pounds is a burden that cannot be borne continuously on the back of a horse. A horse may draw twice that amount, but cannot carry such a load. Mules, instead of horses, are selected for the transport of wounded by cacolets, because, as the cavalry say, mules have stronger backs than horses; besides, mules have the advantage of getting along better and more safely than horses in the mountains, although the Mexican horse (and probably every horse raised in the mountains) is not in any way inferior to the mule when it is necessary to surmount difficult passways. But even for the back of a mule 400 pounds is a burden that can only be carried by the largest and strongest mule. For this reason, the French in Mexico brought with them droves of large and strong mules. Such an outfit is directly very costly, and indirectly yet more expensive from the outlay for the care and feed of animals. But there was no alternative; for a sufficient number of strong capable mules could seldom be obtained in that country by requisition. The Austrian corps using the cacolets only as an auxiliary means for the transport of wounded, employed such mules as could be procured through requisition at the time and place, and it sometimes happened that these animals, although the largest and strongest of those on hand, would break down under their load, obliging the wounded to remain for hours lying on the roadway, until the mule could recover itself, or other means of transportation could be improvised. In accidents of this kind, we were quite satisfied if the wounded man did not sustain injury at the breaking down of the animal. Even the largest and strongest mules could not always be made immediately serviceable. In Mexico these animals live, as the horses, in wild droves on the fields. They are caught when wanted for sale, and then are unfit for service as pack-animals. They break and destroy everything that is packed on them. Several months elapse until they are tamed and can be employed to carry, and a mule, strong and tame as it must be for the purpose of carrying cacolets, costs at least 200 pesos (silver ounce). The cacolets as well as the litters have, besides the disadvantage that they afford to the sick or wounded man, little or no protection against the influences of the climate; yet such protection is as much needed as in Europe or Africa, for the sick man must be guarded against the tropical sun as well as against the tropical rain. But these do not exhaust the inconveniences of this means of transport. I have tried riding on a cacolet, and found that it depends on the gait and form of the animal as to what degree of discomfort the patient experiences. Some mules have such an unpleasant gait that the patient, either sitting or lying, feels as wretchedly as if subjected to the rolling motions of a small screw-steamer. Even with a well-gaited animal, the constant swinging motion is unpleasant. The upper part of the body of a man seated in a cacolet swings to and fro like a pendulum, pivoting at the level of the knee joints. Besides, the sitting posture, with the patient strapped to his seat, can only be borne by the slightly sick or wounded, and even these will be fatigued by the forced position and swinging motion in a transport of this kind. Finally, the cacolets and litters require so much room, that it is quite impossible to move them through narrow mountain passes, such as our wounded had to traverse repeatedly in the Sierra del Norte, in Mexico. In other cases, mountain roads passing a projecting rock made such abrupt curves that the mule burdened with two wounded men was obliged to keep close to the margin of the road, where one of the patients would be actually suspended over a yawning abyss, in constant danger of life. Moreover, from the method of packing, the centre of gravity is placed so high that, in the steep and abrupt descents to be passed, even the safe-going mule lost its balance. A mule carrying a mountain howitzer was precipitated down a ravine into a watercourse. It may be concluded that this mode of transport has neither the merit of simplicity nor of fulfilling its purpose, and can only be resorted to when no better means of transport can be had; moreover, that cacolets, at the present day, are to be considered as obsolete, and to be used only where they are still on hand, and that no more new cacolets or litters should be provided. We must, in fact, resort to entirely new measures for the transport of the wounded. We must consider not only the numerous wars carried on in late years in localities separated from the soldier's home by immeasurable oceans, in China, India, Mexico, and in the South American Republics, but the late European wars in Italy, in Schleswig-Holstein, and in Austria. There we shall see that already, with the field-sanitary regulations hitherto in use, the transport of wounded should be divided into two classes: 1, the transport of wounded and sick for short distances; 2, the transport of the same for greater distances. We need not repeat that transport by means of cacolets or litters, is adapted neither for short nor long distances. Moreover, in central Europe, the breeding of mules is less extensive than in Mexico. In Europe, there would be, for this reason, an insufficient number of suitable pack-animals."

required for sick-transport. They can be taken into broken and precipitous places where wheeled vehicles are utterly inadmissible; or can convey the wounded over distances far too great and tedious for the employment of hand-stretchers. Professor Longmore, after summing up these advantages, observes, with equal justice, that they are only attainable when, in the first instance, mules of sufficient strength and docility can be procured, with attendants capable of training and harnessing them properly, of placing patients on the conveyances in the best way, and taking care of them on the march. Without these adjuncts, in actual campaigning, the animals and appliances will be unserviceable (Longmore, *op. cit.*, p. 294).

In 1868, Mr. W. B. Rooker, of Prince George's county, Maryland, submitted to the Surgeon General and Quartermaster General a plan for "an attachment to a saddle for the use of a sick and wounded soldier," which he proposed should be made part of the cavalry equipment.¹ This proposal naturally met with little favor; but it was repeatedly brought to the attention of the War Department, and, in 1874, permission was granted that twelve of these contrivances might be made at Watervliet Arsenal. Subsequently a board examined² them, and reported that they might be serviceable at times, furnished in the proportion of two for each company, for cavalry expeditions in mountain regions. In the summer of 1875 the twelve experimental saddles were distributed to cavalry commands in Wyoming and Dakota, and pronounced valueless.³ The form or arrangement of this apparatus is indicated in the adjoining wood-cuts (FIGS. 13, 14). Its alleged advantages were again brought before the military authorities, when, in August, 1876, General Sherman dismissed the

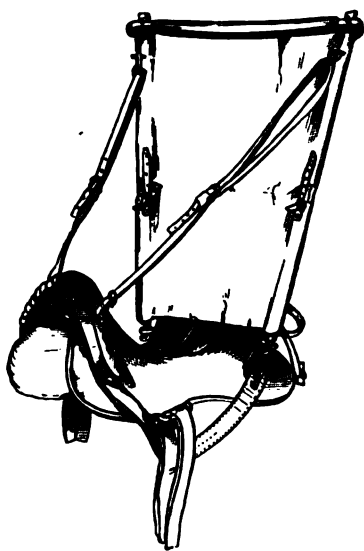


FIG. 13.—ROOKER'S saddle-attachment for the support of wounded men.

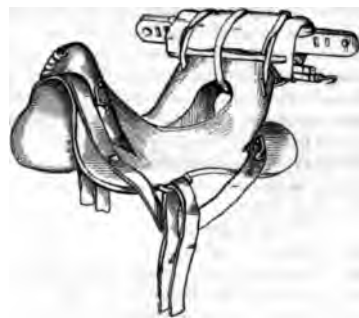


FIG. 14.—ROOKER'S saddle-attachment packed to a McClellan saddle.

¹ The following description of this contrivance was filed with the application for a patent: "This so-called ambulance saddle is an ordinary cavalry saddle, having an attachment consisting of two upright bars out and hinged in the middle, a cross-bar at the top of the uprights to support the head, a canvas back, and two leather straps, with buckles, so arranged as to support the apparatus to be more or less inclined, to suit the rider. When the upright bars are placed in the canvas, they need not again be taken out, but may be folded at the hinges, and, with the straps inside, may be rolled into a compact bundle and attached by the coat-straps to the cantle. Its weight is four and six-sixteenths pounds, and probably this weight might be considerably diminished. When intended to be used it may be thus adjusted: Unstrap it from the cantle and place the sick or wounded man in the saddle; insert the iron keys in the lower ends of the uprights in the eye-bolts, especially attached to the saddle for this purpose, on each side, near the base of the cantle; put on the cross-bar and key it; hook the straps to the eyelets in the upper parts of the uprights, having first buckled the lower ends of the straps into the staples in front of the pommel; then by the middle buckles elevate or depress the head, as may be required." In a letter to the Secretary of War, dated January 5, 1874, * * * "My invention is intended expressly for cavalry, but like any ambulance arrangement may be used for infantry if desired. It is so constructed that it may be taken apart, rolled in the piece of canvas forming the back, and strapped to the saddle like a valise or other bundle, its weight being under six pounds and its bulk inconsiderable. Each cavalryman may carry his own, and, in case of being wounded or taken sick on a long march, this apparatus may in the short space of five minutes be so adjusted as to afford him a comfortable conveyance. An umbrella may be readily attached, though not an essential part of the apparatus. I have had the pleasure of showing it to a number of army surgeons and other officers, who, I am happy to say, have expressed high approbation of the design, saying that numberless men by its use might be conveyed from the field who would otherwise be unavoidably left."

² The Board, consisting of Colonel F. D. CALLENDER, Ordnance Department, Assistant Surgeon J. S. BILLINGS, Medical Department, and Captain C. E. DUTTON, Ordnance Department, convened at Washington Arsenal in February, 1875, and gave the opinion that "The Board do not think it advisable to encumber the cavalry soldier with the carrying of this ambulance attachment, however light it may be made, as it is deemed important to his efficiency to diminish rather than increase the number of articles he is to carry, and to limit them to those of prime necessity. The Board are of the opinion that the use of the attachment in front of the saddle is of little or no value for the carrying of the sick or wounded soldiers; but, that altogether this ambulance saddle has sufficient merit to warrant its trial as an auxiliary to ambulances, stretchers, or other means in charge of the Medical Department for carrying the sick and wounded, and that the reports of officers who may use them in the field should furnish the basis of a final judgment upon their merits and usefulness. For a cavalry expedition or scouting party, which is not and cannot be provided with wheeled transportation, as in certain parts of Arizona and Utah and the Northwest, it is thought probable that if this apparatus were furnished in the proportion of about two to each company it would at times be of service. It would not do for the transportation of severely wounded men." * *

³ The saddles were sent to Rock Island Arsenal April 10, 1875, subject to the order of the Lieutenant General, and from May 8th to July 6th, 1875, three were sent to Lieutenant-Colonel G. A. CUSTER's command, two to Fort Laramie, two to Major E. M. BAKER's command, three to Fort Leavenworth, one to Fort Brown, one to Colonel B. H. GRIERSON's command. Two written reports respecting them were sent by the officers requested to test them. Captain J. MIX, 2d Cavalry, reported from Camp Brown, Wyoming, June 12, 1876: * * * "The back is so arranged that the rider cannot lean back, and in going down steep places his position is painful in the extreme. I have never seen a place so destitute of resources that I could not improvise a more comfortable arrangement of carrying a sick or wounded man." Acting Assistant Surgeon T. G. MAGHEE reported, June 10, 1876, "I have examined and tested the new ambulance saddle, and for practical use consider it inferior to many, if not all, of the packs and litters commonly constructed to suit such occasions by every one serving in the mountains."

matter with the endorsement: "I have examined the Rooker ambulance-saddle and do not hesitate to pronounce it useless in war or peace." Assistant Surgeon S. S. Jessop, U. S. A., has communicated an instance in which an officer (Lieutenant F. B. Sherman, 15th Infantry), when disabled, was conveyed for some distance with the aid of a contrivance analogous to the Rooker saddle attachment. Mr. Sherman has had the goodness to furnish a statement, which is subjoined in a footnote,¹ of his recollection of this incident. In great exigencies, a wounded man may be carried off on horseback,² either tied on, suspended in a blanket,³ or supported by a pad or pillion behind a comrade, to relieve him of exertion in guiding or holding on to the horse:⁴⁵⁶

In the operations against the Modoc Indians, in the lava-beds of California, extending from December, 1872, to May, 1873, the ordinary methods of transport were found unsuitable and a form of mule-litter, devised by Assistant Surgeon H. McElderry, U. S. A., proved serviceable and well adapted to the exigencies encountered. Dr. McElderry sent one of these litters to the Army Medical Museum, and in a letter dated Fort Klamath, March 3, 1874, described it as follows:

"I transmit a box containing a mule-litter, devised by me for use in the lava-beds about Rhett Lake, California, during the late Modoc campaign,—the ordinary form of litter drawn by two horses having been found entirely unfitted for service in such broken country, abounding in narrow and winding defiles. A harness gear, *aparejo*, and appliances, to be used with the litter, is also contained in the box. It is believed that this form of litter, besides being especially adapted to the character of country for which it was devised, will be found also of service in mountainous districts, and on the frontier generally; and it is

¹ Mr. SHERMAN's note is dated Fort Union, New Mexico, January 25, 1877: * * "Dr. JESSOP has confounded two occasions. The only time I have been wounded my transportation was an army wagon, and I do not think a description of this mode of conveyance is needed, nor are my recollections of my twenty miles ride sufficiently pleasant to enable me to recommend such transport. But when out on a scout in Texas some years since, I was taken very ill and completely prostrated, so that I could not sit upon my horse. It was an absolute necessity for our party to get back to the fort, and I found myself an encumbrance. Some Tonkawa Indians, along with us, said they knew a way to carry me. I was placed in a saddle and a lean-back was made; a bent twig or sapling inclined at an angle of 50° was attached to the rings at the crupper of the saddle, and I was securely attached to it by a rope. My legs were stretched out along the side of the horse and also tied in some way to a small branch run along by them, and attached to the saddle. I was too sick to remember much about it, but know I felt secure. The back was made by running the ends of the sapling into the saddle-rings. My arms were tied to my body, but not closely. I think I have read of a similar method used in Europe, but much improved."

² PERCY (Art. *Despotats*, in *Dict. des Sci. Méd.*, T. VIII, p. 565) believed it historically established that the ancient Celts carried off their wounded in battle by laying them across the backs of horses. It is well known that under the reign of the Emperor LEO I, who obtained victories over the Huns, but was repulsed by GENSERIC in Africa, in the latter part of the Vth century, it was customary for ten or twelve mounted men, called *despotati* (their saddles provided with two stirrups on the near or left side of the horse), to follow each cohort, to pick up and transport wounded men. It is stated by ISENSEE and COHEN, in their history of medicine (Gröningen, 1843), that in the succeeding century the Emperor MAURITIUS ordered that each cavalry division of 400 men should be followed by 8 or 10 picked men of activity and determination, entrusted with the duty of aiding the wounded by giving restoratives, applying temporary dressings, and transporting them from the field of danger. FISCHER (*Lehrbuch der Kriegs-Chir.*, 1806, p. 208) adds that each received an honorarium for every wounded man he succored.

³ In their most instructive work entitled *Shifts and Expedients of Camp Life*, Messrs W. B. LORD, Royal Artillery, and T. BAINES, F. R. C. S. (London, 1871, p. 687), suggest: "In a case of great emergency the ends of a blanket might be knotted together; and, two men being laid in the bights, the central part might be laid across the back of a horse, with one man hanging on each side, and secured with the best means available at the moment. Among civilized nations it would, perhaps, be better to leave the wounded to the mercy of a victorious enemy than to risk the extinction of life by such rough means; but in fighting savages, no living man ought, under any circumstances, to be left in their power, and a soldier had better die under the rough, though kindly, efforts of his comrades to remove him than become a prisoner—to be kept alive as long as he is capable of enduring torture."

⁴ SCHMUCKER (J. L.) (*Chirurgische Wahrnehmungen*, Berlin, 1774, Theil I, p. 346) relates: "After the battle of Liegnitz, August 15, 1760, * * I ordered the severely wounded to be placed on pork-, provision-, or bread-wagons, and the slightly wounded to move along slowly without equipment. There yet remained five hundred men, mostly wounded in the upper extremities, for whom no means of transportation were provided. As it was necessary to follow the moving army, I quickly made up my mind as to the course to be pursued. I ordered the men to be put together in one place, and proceeded in person to the Adjutant General von Krusemarck. I informed him that these men were entirely unable to march; but if the General would give orders to unseat a regiment of dragoons, all might be carried along. My proposition was assented to; in the course of half an hour all the wounded were on horseback, and the dragoons marched alongside. In the evening we reached Parchwitz, where the army camped. The next day we marched in the same manner, until, on the third day, I reached Breslau with all the wounded."

⁵ "After the abandonment of the siege of St. Joan d'Acre there was a total want of any kind of conveyance for the wounded, and Bonaparte directed that all the horses of mounted officers should be used for this purpose, an order he enforced by example, by marching on foot with the rest of his army. The wounded must otherwise have been abandoned in the desert to have their throats cut by the Arabs."—(LARRY, *Camp d'Egypte*, p. 312.) In the Sepoy mutiny of 1857, in General LUGARD's field force, on many occasions the number made helpless by wounds or sickness was greater than the regular means of transport would accommodate. To leave these disabled men would have exposed them to atrocities too horrible to contemplate. Yet an advance was imperative. Under such circumstances every available means of conveyance was adopted, and the disabled were taken to a place of safety under a strong cavalry escort, which promptly rejoined the main body and enabled the advance to be continued.—(GORDON (C. A.) *Army Hygiene*, London, 1866, p. 217.)

⁶ Prof. A. BERTHERAND, Director of the School of Medicine of Algiers, remarks (*Campagnes de Kabylie*, Paris, 1862, p. 116): "Every one has heard of the sure and rapid means employed by the Arabs to transport from the field of battle the victims of shot-wounds. We have often seen from a distance, notably during the murderous expedition of 1840 and 1841, groups of the enemy assembled about a pack-animal or a stretcher hastily constructed of two branches, and carrying off at a run a precious burthen, revealed by a fluttering burnous or a pendant limb, or a dead or wounded soldier. But, at a distance, we could not discern how the patient was attached and supported on these improvised appliances. Thanks to Staff-Captain Dupin, who had occasion to make a nearer inspection of them, we are enabled better to appreciate their mechanism and adaptation to exigencies. The removal of the wounded on *traverses of wood* covered with moss, dry leaves, the cloaks or outer garments of the country (*burnous, haïk*), or sometimes by huge grain-sacks (their's), need not detain us. It is hammock system in its primitive rudeness, easily constructed of the first available materials, and far inferior to the perfected stretcher (brancard) of the French army. Transport on the back of mules or horses is of greater interest, responding to more important indications. The plan is this: On either side of the large pack-saddle with which the animal is equipped, at a level with its most projecting part, a large sack stuffed full of straw, leaves, or grass, is attached, in such position that the convexities of the two sacks and the upper surface of the saddle are all in the same horizontal plane. The surface is covered with a pallet of hay or straw or by some sort of mattress made of folded stuff, on which the patient is laid cross-wise to the animal, and in the line of the long axis of this couch. Afterward branches are arched over the litter to protect the patient, if need be, from the sun or rain."

respectfully suggested that a certain number of them be constructed and issued at frontier posts for trial. They should invariably be used with the *aparejo*, the back of the animal being first protected by two ordinary saddle-blankets properly folded. If this be done and the litter be properly secured in its place, the ordinary precautions being taken, the mule's back will never be made sore. As originally used, the litter was lashed with ropes to the *aparejo*. This is perhaps the more satisfactory way of fixing it in its place. As, however, a skilled packer may not always be on hand, it was thought advisable to secure it with a broad girth. This plan has been found to work well and satisfactorily. Owing to the want of the proper materials at the post, the litter forwarded could not be made exactly as was devised. For instance, all the hinges about it should be larger and stronger; the rings, through which the arm-straps pass, should be triangularly shaped; and all the rings that come in contact with the ropes or canvas should be made of galvanized iron, to prevent rusting. The litter forwarded was constructed for me by Hiram Field, quartermaster's employé at this post, and for many years past in the Government service. To him I am also indebted for several valuable suggestions in originally planning it."

An additional report on this subject, dated Washington Arsenal, January 17, 1877, was transmitted to the Surgeon General by Dr. McElderry, with drawings by Lieutenant J. P. Wisser, 1st Artillery, of the different parts of the apparatus.

"I have the honor to transmit for your consideration drawings of a mule-litter which I respectfully recommend for adoption in the army for use on the frontier in campaigns against hostile Indians. The following are some of the advantages of this form of litter. As was demonstrated by experience in the field during the Modoc campaign in the lava-beds in southern Oregon and northern California in 1873, the proposed style of litter is specially adapted for use in broken, rough, and mountainous country; along narrow and winding defiles, abounding in sudden and abrupt turns and angles; and in places and under circumstances generally where no other kind of litter could be employed. A wounded man can be transported on this litter with entire safety on the back of any steady pack-mule or horse, taken indiscriminately out of the pack-train; the animal not requiring any special training before he will pack it, otherwise than he has already received in the pack-train. Every officer of any practical experience in scouting on the frontier knows that, before the pack-mules or cavalry horses can be made to work satisfactorily in the double horse-litters now issued in the army, every such animal requires, in each case, a special and more or less prolonged system of training and daily drills in these litters. Several litters are usually broken to pieces before the animals can be made to work steadily. It is nearly always found impracticable to give the animals such special training, for the reason that on an Indian campaign transportation is always cut down to the minimum, and consequently no extra animals can be taken for use in the litter-train. It is seldom possible to obtain the quartermaster's pack-animals for such preparatory drills, as they are forced by the circumstances of the case to carry packs all day, and when camp is reached at night there is no time and the animals are in no condition for any such drills. The consequence is, that when the urgent necessity for the use of the litter-train actually arises, among all the animals turned over to the medical officer for such service there will not be more than one or two that can be used; the others all refuse to work in the litters, and ultimately some other means has to be resorted to for the transportation of the wounded. Only one animal is required for use with this litter, and consequently there is no useless expenditure of labor, as when two horses are required for the transportation of one man. The litter can be folded compactly together, so as to permit a load of grain, provisions, etc., to be packed upon it. The animal having arrived at its destination, the load is removed, the litter is unfolded, and becomes available for the transportation of the wounded back to the base of supplies. By the use of the adjustable iron support, which raises up over the lower end of the litter, a wounded lower extremity can be suspended in the anterior or other splint, and the patient thus carried with much greater ease and comfort than when the wounded member is simply laid upon or fixed to the litter. Used upon the Mexican *aparejo*, which is now universally found in the pack-trains upon the Pacific coast and Texas frontiers, this litter, being well balanced, is easily and comfortably carried by the pack-animal, and consequently has no tendency to make the animal's back sore. This is always found a source of serious trouble in packing the long poles of the double horse-litter now in use. They are so long that they have to be packed crosswise on the pack-saddle, and in consequence invariably cause so much wobbling of the saddle that, after they have been carried for a day or two, the pack-mule gets a sore back, and is henceforth unfit for use for some time during the campaign. As will be seen, the present form of litter is substantially the same as the one devised by me and constructed to meet the emergencies of the service in the Modoc campaign, and the model of which is now in the Army Medical Museum. Like that model it is intended to be constructed of strong wood braced with iron rods, with strong hinges to bear the rough usage of frontier field service, so as not to be easily broken or otherwise rendered unfit for service. Several modifications, suggested by experience and reflection, have been added, in order

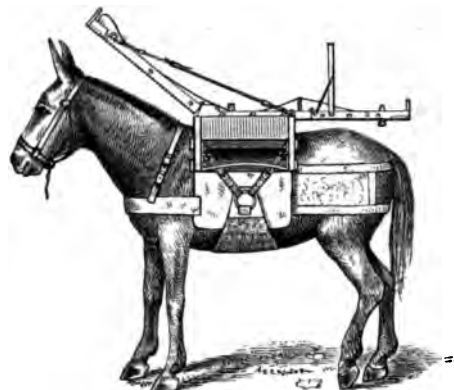


FIG. 15.—MCELDERRY'S single mule-litter.

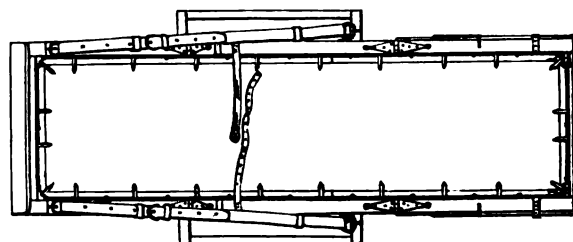


FIG. 16.—Plan of MCELDERRY'S single mule-litter.

to cause the litter to fold up more compactly and to add to the comfort of the patient. The upper part of the heavy canvas which forms the bed is intended to be made of double thickness, to be left open above. Into the pocket thus formed, hay or prairie-grass is to be stuffed, and the upper edges of the canvas tied together with cords sewed on for the purpose. This forms the pillow. A canvas awning has been sketched on the plan, intended to be stretched from head to foot-board of the litter over the raised iron support, and tied in place by the cords attached to its edges. An *aparejo*, furnished with a good broad breast-strap and crupper, is first lashed to the animal's back with its girth in the usual way, and the litter, being then placed upon it, is firmly fixed in position by means of an extra-broad California horse-hair girth, as shown in the figure. It has been suggested to me that this litter might be constructed of iron, to render it lighter and more compact for transportation. It is possible that this might be done, and I intended to submit drawings for a model of this form of litter to be constructed of iron. Upon reflection, however, I am of the opinion that this could be much better done after due consultation and deliberation with some competent practical mechanic authorized to construct the litter of such material. It is believed that by the aid of the drawings herewith submitted, and the model already in the Army Medical Museum, and any required information that I should be able to furnish him, that a competent mechanic would have no difficulty in constructing two models, one of wood, braced with iron rods, and one entirely of iron. If the style of litter herewith submitted should receive the approbation of the Surgeon General and the construction of a number be authorized for use in the Army, I would respectfully suggest that two such model litters be made for inspection and comparison, when the one considered most suitable for the service may be selected as a model and guide for the construction of the others. The drawings herewith submitted were kindly made for me by Lieutenant J. P. Wisser, and I am greatly indebted to him for the artistic and accurate manner in which he has performed the work."

Dr. McElderry's litter weighs, without a mattress, fifty-four pounds. The *aparejo* and appurtenances weigh fifty-one pounds. Like the litter of Captain Thistle (*ante*, p. 5) and those exhibited by MM. Philippe and Locati,¹ at the Paris Exposition of 1867, it has the advantage that its width does not much exceed the outer limits of the flanks of the pack-animals; a condition adapting it to the passage of narrow defiles or cañons, or of roads encumbered by vehicles.

The following passage and illustrations are extracted from a report to the *Conseil de Santé* by M. Gouchet,² médecin-major, serving with the 1st Zouaves, in the French corps sent to Mexico, in 1864. Referring to a skirmish at *Espinoso del Diablo*, January 1, 1865, and describing the disposition made for the carriage of the slightly wounded, he remarks:

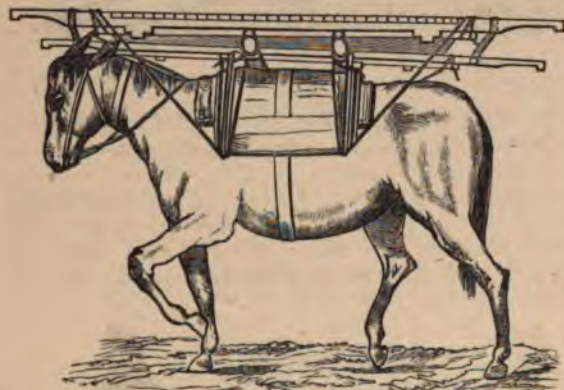


FIG. 17.—Single mule-litter used by the French in Mexico. [After GOUCHET.]

commencing the march, the patient, laid on the stretcher, was placed on the pack-mule, and the handles of the stretcher were strongly secured, as already said, and the men of the train being at their posts, they moved off at a very gentle gait, to avoid jolting over the narrow and rugged paths. The patients on the stretchers bore the journey very well, and, after a little experience, preferred this mode of conveyance to the regulation litters, which have great lateral swaying, very fatiguing on such difficult roads. They only complained of feeling on their backs the pressure of the forward bow of the pack-saddle, which, after a while, much incommoded them. But the patients themselves remedied this inconvenience by shifting their positions, or by stuffing in something to increase the thickness of the pallet at that part."



FIG. 18.—Patient borne on a field-stretcher secured to a pack-saddle. [After GOUCHET.]

This adaptation of ordinary hand-stretchers to the purposes of a single-litter mule conveyance is admirable in principle; and if means can be devised to secure such stretchers on pack-animals without pitching them so high as to endanger the patient and encumber the animal, such arrangement would be the simplest and best.

¹ VAN DOMMELEN (G. F.), *Essai sur les moyens de Transport et des Secours en général aux Blessés et Malades en Temps de Guerre*, La Haye, 1870 pp. 12, 13, et Planche VI, Figs. 1, 2. See GROSSHEIM's comments on McELDERY's litter, in *Deutsche Mil. Zeitschr.*, 1877, p. 68.

² *Recueil de Mémoires de Médecine de Chirurgie et de Pharmacie Militaires*, 3ème série, 1865, T. XIV, p. 520.

A mode of transporting sick and wounded by conveyances that at one end rest on the ground, so that the patient is drawn, but only partially sustained, by the pack-animal, is mentioned by early travellers among the North American Indians. Parkman indicates¹ that in the war with Pontiac, in 1763, the colonists carried their wounded by this contrivance, and, in a later work,² refers to the *travail* used by the Oregon Indians; and Lewis and Clark³ resorted to it in 1805, to carry a wounded hunter of their party. Latterly, this method of transport has received much attention from medical officers, as well adapted to the exigencies of frontier service. Surgeon C. R. Greenleaf, U. S. A., has remarked on this form of conveyance:

"I know of nothing better for scouting parties, than a litter made after the following plan, which is borrowed from a custom among the Indians, quite familiar to all officers who have seen any service on our frontiers. It consists of four ash poles, two for shafts and two for litter-poles—the former are 7 feet 6 inches long, 2 inches wide, 2½ inches deep at the butt, and 1½ x 1½ inches at the point; the latter are 8 feet 6 inches long, 2 inches wide, and 2½ inches deep, with rounded edges and corners. On one end of the litter-pole is riveted two wrought-iron (best Norway) bands ½ inch thick and 1½ inch wide. One of these collars is set 2 inches from the end of the litter-pole, and has a diameter of 4½ inches by 2 inches; the other is set 12 inches from the end of the poles, and has a diameter of 5½ inches by 2 inches. The opposite end of the litter-pole is shod with an iron thimble 1 foot long. Two cross-bars, 30 x 1½ x 2½ inches, with a square collar of iron ½ inch thick by 1½ inch wide on each end, serve to keep the poles separated

and steady; the collars should have a diameter of 2 x 2½ inches, and the litter-pole must besquare at its front end and 2½ feet from the rear end for their reception. A canvas bed 6 feet by 32 inches, with strongly bound eyelets 8 inches apart on the upper end and upper three feet of the sides, and permanently fastened to the lower three feet of the sides, completes the affair. The litter is dragged by a horse or mule hitched into the shafts—the rear end of the litter-poles resting on the ground, the patient occupying the canvas bag in the middle. To put it together, the small end of the shaft is passed from behind forward, through the rear and largest collar on the front end of the litter-pole, thence through the smaller collar, and then "pulled home," until the butt of the shafts is tightly embraced by the collars; the cross-bars are then put into their respective places by slipping their collars over the front and rear ends of the litter-poles and pushing them securely home, the canvas bed lashed to the poles by rope passing through the side eyelets and around the poles, and through the end eyelets and around the cross-bars; the ropes at the head of the bed should be slack, to afford "bag" enough to the canvas to bring the head

and shoulders of the patient nearly on a level with his feet. By the arrangement of splicing the shafts to the litter-poles through collars of unequal sizes, a constant tightening of the parts goes on by the force exerted by the animal in pulling the litter, and no opportunity for loosening occurs; while, as the greatest weight occurs at this point, additional strength is gained through the iron collar and the double thickness of pole. With a collar and harness, which could be carried without much trouble, the litter can be hitched to a mule by a chain attached to the harness, and having on its end a goose-neck pin to pierce the shaft from below, and be fastened above by a nut or lynch-pin. To unship the litter, give a smart blow on the small end of the shaft, which will drive it back through the collars, when it can be taken out; remove the cross-bars, unfasten the ropes, and wrap the poles and cross-bars in the canvas, packing the whole thing like a tent on a pack-mule. For use as a hand-litter, it is only necessary to unship the shafts."

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FIG. 19.—GREENLEAF'S combined hand and horse litter hitched to a mule. [From a drawing by Dr. GREENLEAF.]

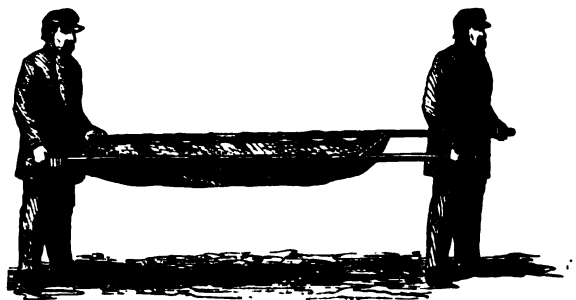


FIG. 20.—GREENLEAF'S combined hand and horse litter used as a hand-litter. [From a drawing by Dr. GREENLEAF.]

¹ PARKMAN (F., Jr.), *History of the Conspiracy of Pontiac and the War of the North American Tribes*, Boston, 1855, p. 601. After the battle of Bushy Run, August 6, 1763, Colonel H. BOUQUET wrote to his excellency, Sir J. AMHERST, describing the litters constructed after the Indian fashion by the four companies under his command to carry off their wounded.

² PARKMAN (F., Jr.), *California and Oregon Trail, being sketches of Prairie and Rocky Mountain Life*: 12 mo., New York, 1849, p. 165.

³ *History of the Expedition under the command of Captains LEWIS and CLARK to the sources of the Missouri, thence across the Rocky Mountains and down the River Columbia to the Pacific Ocean, performed during the years 1804-5-6, by order of the Government of the United States*. By PAUL ALLEN, esquire, Philadelphia, 1814, Vol. II, p. 381.

⁴ Extract from a Report made in compliance with Circular Orders No. 3, War Department, S. G. O., November 25, 1874, by Assistant Surgeon CHARLES R. GREENLEAF, U. S. A., dated Huntsville, Alabama, December 14, 1874. On October 27, 1876, Dr. GREENLEAF contributed to the Army Medical Museum a model of this combined hand- and horse-litter, which is numbered 804 in Section VI, A. M. M.

Efforts were made by several other medical officers to systematize this mode of transport:

In November, 1875, Assistant Surgeon P. J. A. Cleary, U. S. A., reported to the Surgeon General's Office his observations at Fort Sill and elsewhere, in the Indian Territory, on the facility with which the Indians transported their sick and aged or infirm on litters dragged by ponies, and suggested that analogous conveyances might be utilized for the transport of wounded in cavalry scouts, and in marches in difficult country where the use of wheeled vehicles was impracticable. April 15, 1876, Dr. Cleary sent to the Army Medical Museum a model and descriptive statement of a modification of this Indian litter that he

would recommend as adapted to army use. This model is numbered 774, Section VI, A. M. M., and is represented in the accompanying wood-cut (FIG. 21). Dr. Cleary writes: "In the process of constructing the model of a horse-litter which I send to the Museum by express, I have more than once altered the details of my original plan, and the model, although as near an approximation as I can make to my design, does not exactly carry out my ideas. The chief defects of the model

are that if enlarged to full size the parts would be too heavy and clumsy. The shafts should be light, and, at the same time, strong and elastic. The wood-work should be all oak. The harness is of secondary importance, and on the model is but rudely represented, but it is the best I can construct with the material at my disposal. But one point in the harness needs special notice, viz: the straps across the horse's hips, which support the shafts; the object being to prevent the horse, in case he rears up, from



FIG. 21.—Horse-litter proposed by Dr. CLEARY, U. S. A.

jumping out of the shafts, or kicking the patients; by this strap he lifts up the litter every time he attempts to kick, and so cannot reach the patient. However, a kicking horse is not the kind for the sick under any circumstances. As to the litter proper, it needs but little explanation. Each side-pole is jointed; by withdrawing a pin it comes apart, leaving the shafts in the

harness, and the stretcher-frame disconnected. The length of the connected side-poles should be 17 feet, viz: 5 feet occupied by the horse, 3 feet from rear of horse to first traverse or cross-piece of litter, 7 feet for bed of litter, 2 feet from bed of litter to end, total 17 feet. I have a large one almost completed, and shall test it in a short time and report how it works. The advantages which the litter appears to me to possess are:

1. Simplicity of construction.
2. Facility of transportation, as it can be easily rolled up and carried either in a wagon or strapped to a horse.
3. It can easily be drawn by one animal.
4. It requires but one man to work it, who can, by laying it on the ground, easily shift even a severely wounded man into it, and then lifting it can readily attach the litter proper to the part forming the shafts. It requires two or more persons to lift a wounded man into an ambulance wagon.
5. The facility with which a patient can be brought into a hospital—here, again, by detaching it at the joint it is converted into a hand-litter on which the patient can be conveyed by two men to the ward of the hospital.
6. Regularity of its motion; instead of jumping over irregularities of the road, as a wheeled vehicle, the poles, by dragging along, necessarily ascend and descend all irregularities of the ground by gradual motion.
7. Its general adaptability for any kind of ground—for instance in crossing cañons and deep gullies, the litter proper could be easily detached, and a man at either end carry it as a hand-litter over any obstruction and again attach it, and finally, for any slight obstruction, the driver, without detaching it, could lift the rear—the forward part being held in the harness—until the obstruction was passed; none of which can be done with an ambulance. Were it to be sent out with a cavalry command, and not required for actual use, it would occupy but a small space, and need not have even a horse sent with it—when, if required, the trooper's horse could be used to haul it. I should explain that the upper and lower straps [attached to the side poles but not represented in the drawing] are intended to pass under the patient's buttocks and over the thighs, fastening to the upper part of the litter—the upper one to pass under the arms and be similarly fastened; only one pair need be used at a time, this to counteract the tendency to slip, due to the incline of the litter.

Assistant Surgeon Curtis E. Munn, U. S. A., in a report to the Medical Director of the Department of the Platte, dated April 12, 1876,¹ relates his experience in the use of horse-litters, or "travaux," in an expedition against hostile Indians on the Powder River:

"The command left Fetterman on the morning of March 1st. I was supplied with four ambulance wagons and one supply wagon. * * Early on the morning of March 3d, at a camp on the south fork of the Cheyenne River, about thirty

¹ An expedition against hostile Indians, known as the "Big Horn Expedition," was organized at Fort Fetterman, Wyoming, in February, 1876. It consisted of five companies of the 2d Cavalry, five of the 3d Cavalry, and two of the 4th Infantry, under command of Colonel J. J. REGANOLD, 3d Cavalry. Leaving Fort Fetterman March 1, 1876, the detachment reached Crazy Woman's Fork on March 7th, and there left the wagon-train and proceeded northward with a train of 350 pack-animals, and attacked an Indian village on Powder River March 17th. The troops resumed their stations March 27, 1876, having lost four killed and six wounded. The march was made in very inclement weather, the thermometer sometimes falling below 26° of the Fahrenheit scale.

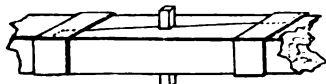


FIG. 22.—Splice of the shaft of the above litter.

miles north from Fetterman, a small party of Indians fired on two herders, who were on duty near the troops, and wounded one severely. During the next four days he was transported in an ambulance wagon eighty-four miles to camp on Crazy Woman's Fork, where he was left with the supply train, doing very well. On March 3d, at a camp on the Powder River, Indians fired into the groups standing by the camp-fires, and slightly wounded Private Slavey, Co. I, 4th Infantry. March 7th, at Crazy Woman's Fork, myself and assistants were occupied selecting stores to be carried on pack-mules, and generally preparing for cutting loose from the wagon train, which was to return to Old Fort Reno, and there camp until our return from the north. The two companies of Infantry were left for its protection. Here I left Acting Assistant Surgeon J. Ridgely, with instructions to establish a field-hospital, to be in readiness on our return, as it was highly probable there would be many wounded or sick. * * On the evening of the 7th, the Cavalry, accompanied by a 'pack-train' of about 360 mules, again started north, and marched all night. The medical supplies were carried on two pack-mules. They consisted of a valise of instruments and dressings, chloroform, etc. (a complete surgical outfit), a medicine pannier well stocked, and two blanket cases, each containing 12 blankets, a rubber bedcover, and several bottles of brandy. * * The march for days was over mountains, to, and then along the Tongue River, then across a divide in the direction of the Powder River. On March 16th, at two P. M., having marched 22 miles that day, the command was halted and divided; two battalions and the pack-train to remain, and three battalions, under Col. Reynolds, to follow a trail by night march. Medical stores were again divided, and, directing Acting Assistant Surgeon Stevens to remain with the train, I started, with the necessities indispensable for an engagement on the horses of myself and orderly. These comprised an amputating knife, ball-forceps, artery-forceps, and a pocket-case, two pots of beef-extract, a bottle of chloroform, one of brandy, oakum, rollers and lint, cigar-box covers and 'binders-boards.' My orderly had a field-medicine case complete. * * Up to this time, on our march over slippery roads, but one casualty had occurred of sufficient severity to incapacitate any one from horseback riding. Corporal Moore, Co. D, 3d Cavalry, had been rendered helpless by a fall of his horse upon his body, and for several days he had been transported in the rear of his battalion on a rude imitation of an Indian 'travail.' He was left,

with several men suffering with inflammatory rheumatism, in care of Acting Assistant Surgeon C. R. Stevens. The idea of transport by the travail I took with me to the field, and it encouraged me to feel that my little outfit was adequate, and if to-morrow it should be found necessary, with poles from the woods and cavalry horses from the command, I would surely be able to transport the wounded with the column. On the morning of March 17th, after an exhausting night march, the command struck an Indian village on the Powder River and fought for several hours, the Indians making a brave defence. As soon as they were driven from their village, it was

easy to construct *travaux* from the lodge-poles, and upon one of these curious conveyances, which I constructed in fifteen minutes, Pt. Egan, of Co. K, 2d Cavalry, who received a penetrating wound of the abdomen, was brought about one hundred miles, over the roughest trails, to the ambulance station, which he reached in convalescing condition. I had never seen, or thought of, such a method of transportation for wounded before, and am naturally much pleased at the perfect success attending their use. We followed trails over mountains and ravines where it seemed impossible for a horse to go, and although the frequent exigencies of precipitous side-hills and deep gulches elicited much forcible and profane language, addressed to drivers and mules, to secure safe conduction, no accident occurred. All, including two cases of acute rheumatism, were brought safely. To keep up with the column frequently necessitated the trot or gallop, and strangely enough the rheumatic cases seemed to improve while undergoing this harsh treatment. I would recommend the employment of this mode of transportation whenever troops are obliged to leave wagon-roads. A few well-seasoned poles about 16 feet long should be carefully prepared, and provided as part of the outfit. They can be dragged along in bundles behind two or three packed mules, until a drag should be needed. Several of the animals in the train should be provided with collars and hames, with short chains and hooks to attach to rings in the poles. A common girth will support the poles over any saddle, and two lariats will make the cradle behind the mule or horse, and serve to bind the patient securely upon the apparatus. A patient can be more comfortably transported over a rough country in this way than by the best ambulance, but the poles must be well-seasoned and of elastic material, as ash, lance-wood, or hickory. * * The command reached the site of old Fort Reno on the evening of March 21st; a cold rain-storm during the afternoon completed a long sum total of discomfort. My notes say that we marched 10 hours, over the worst trails yet traversed. I had cheered my patients with repeated statements about the comforts prepared for them at camp at Reno. I found only the hospital tent pitched, its interior wet, no fire in or about it." * * *



FIG. 23.—Wounded soldier on a "travail." [From a photograph.]



FIG. 24.—Wounded soldier conveyed on a double mule-litter. [From a photograph.]

¹ Dr. MUNN indicated, on the photographic print from which the cut is copied: "This is the picture of a poorly-contrived 'travail.' It should be drawn by two mules, and the poles should be elastic. When a stream is crossed, men take up the ends of the poles and carry them across."

² Assistant Surgeon MUNN, in transmitting the photograph copied above, remarks: "The litter with two mules, long in use, I believe to be inferior to the travail. When the animals move at an uneven pace, the result is disastrous to the harness and to the patient."

In connection with his report of sick and wounded for June, 1876, in relating the circumstances of an engagement with hostile Indians¹ at Rosebud Creek, Montana, June 17, 1876, Assistant Surgeon A. Hartsuff, U. S. A., made the following references to the conveyance of wounded by horse-litters and "travois":

"The fight commenced by a sharp attack from the hostile Indians, who evidently thought to surprise us. They were all well mounted and well armed, and seemed to have an abundance of ammunition. Their ponies carried them swiftly over ground that was difficult for us to get over at all, and they did all their firing from their horses, which we were unable to do. The attack was promptly met, both by our troops and our friendly Indians; and the Sioux were driven back, from hill to hill and crag to crag, the ground being a succession of sharp hills, crags, etc. Soon we discovered great numbers of the enemy on our flanks. Evidently they were trying to surround us, and to get to our rear, with a view of capturing our camp, transportation, stock, etc. For they presumed that we had a base; but, what was their surprise, when they got to the ground where they first found us, to find we had no rear! Our headquarters, base, and all, were in the saddle! Every officer and man was mounted, and all carried their rations and ammunition upon their persons, our only extra transportation being two pack-mules, one of which carried medical supplies, and the other tent-flies, shovels, picks, axes, etc. After the enemy, by great exertion of hard riding, had succeeded in finding our supposed base, and finding nothing, their next anxiety and hard work was to get back to their main column. Having no base, and being thus entirely surrounded, and the position of all the troops constantly changing, it was necessary that the medical officers of the command should be very active and vigilant to

prevent any of our wounded falling into the hands of the enemy. The wounded were all collected together and their wounds hastily and rudely dressed, neither time nor circumstances allowing us to give them the necessary care and attention. Frequently, during the fight, we had to move the wounded to safer positions. Not a drop of water could be obtained during the day, for we were on the hills, and the nearest water, Rosebud, a miser-

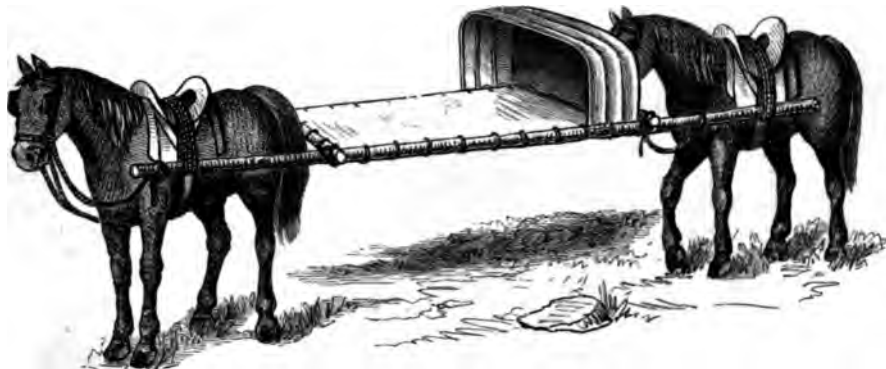


FIG. 25.—Extemporized horse-litter. [From a drawing by Dr. HARTSUFF.]

able little stream, two miles away. At about one o'clock P. M. the firing had nearly all ceased, the Indians having retreated, through deep and narrow cañons, down the Rosebud. It was about half-past six o'clock when the command reached the Rosebud River. Owing to the great heat of the day, no shelter, and no water, and very considerable loss of blood, many of the wounded were much exhausted. Their wounds were all dressed as speedily as possible, and all were made as comfortable as our limited means would allow; but our work then was not done, for the order was to return to the wagon train, and to march early in the morning; the time of marching to depend on time when the wounded could be moved. Mr. Moore and his packers gave

us the necessary assistance; and, by working the greater portion of the night, one horse-litter and five travois were made. Captain G. V. Henry, 3d Cavalry, was placed on the litter (FIG. 25), and five of the wounded soldiers were placed on the travois (FIG. 26); the remainder of the wounded [thirteen in number] rode their horses. At sunrise all was ready, and we at once moved out. I felt very considerable interest in this (to me) new mode of transportation of the wounded, and I carefully watched the behavior of the litter and travois. I soon discovered, however, that *the litter was much better in all respects than the travois, except, perhaps, over comparatively smooth ground*; much

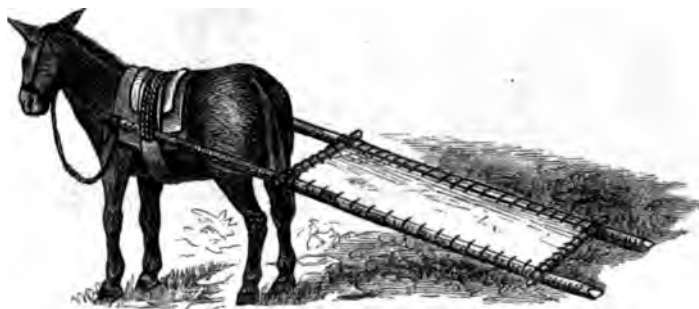


FIG. 26.—Extemporized Mule-"travois." [From a drawing by Dr. HARTSUFF.]

of our route was very rocky and broken, the hills were very steep and cañons deep. Occasionally a little stream and a narrow trail on steep mountain sides. Over such a country, the travois is very troublesome and uncomfortable; so much so did they prove to us, that at night, after the first march, we threw away all of them, and made litters in their stead. With these, we had no trouble; could move as fast as the columns could move over mountain sides, through cañons, over rocks, stones, and

¹ An expedition against hostile Sioux and other Indians, known as the "Big Horn and Yellowstone Expedition," started June 1, 1876, from Buffalo Wallow, Wyoming Territory, and reaching Rosebud Creek, in Montana, June 17th, was attacked by a force of Indians estimated at fifteen hundred in number. The detachments of United States troops consisted of ten companies of the 3d Cavalry, five of the 2d Cavalry, three of the 9th Infantry, and two of the 4th Infantry, twenty packers, and two hundred and fifty friendly Crow and Creek Indians, making an aggregate of twelve hundred and fifty men, commanded by Brigadier-General GEORGE CROOK. In the affair of the Rosebud the detachment lost nine killed and nineteen wounded.

even through deep rivers. We crossed the Tongue River, three or four feet deep, without trouble. The wounded occupants of the litters thought them very comfortable; and even when we reached the ambulance-train, some of the wounded did not want to give up their litters for the ambulance wagons. The horse-litter is quite as quickly and easily constructed as the travois; can be used wherever the travois can be used, and in many places where the latter is entirely useless. The travois are extensively used by all tribes of Indians of this country; but they have, I believe, no knowledge of the horse-litter. For the information of those who may not be familiar with the appearance and construction of the means of transportation to which I have referred, I insert the preceding sketches (FIGS. 25, 26). I also send a sketch of a splint much used by the Indians (FIG. 27): It is quickly made, of small willows, peeled, and woven or tied together by buckskin-strings. They may be of any length, are very pliable and easily fitted to any shape or condition. The splint is quickly applied, pressure is uniform, and, when wrapped around a fractured extremity and tied with strings or buckled with straps, it behaves better than any other form of dressing. Our killed were all buried on the field, and as the Indians did not get at their dead bodies, none of them were scalped or mutilated. Our Indians, Crows and Snakes, took thirteen Sioux scalps, and otherwise mutilated the bodies of the dead Sioux. Assistant Surgeon J. H. Patzki and Acting Assistant Surgeon C. R. Stephens were my assistants in the above-named engagements and on the field, *en route*, and at all times and places they were active and efficient in the discharge of their duties."

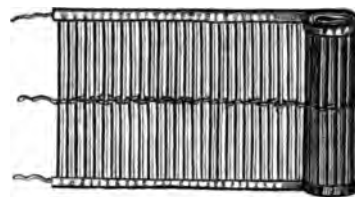


FIG. 27.—Splint of willow-twigs united by buckskin thongs. [From a drawing by Dr HARTSUFF.]

Assistant Surgeon J. W. Williams has supplemented his report of the killed and wounded at the disastrous engagement at the Little Big Horn,¹ June 25, 1876, with the following remarks on transport by horse-litters:

"The ordinary Teepee poles, with which the Indians pitch their tents when in villages, are also used in constructing the travois. The Dakota and Montana Sioux, who use mountain-pine or ash poles, select straight, well-proportioned saplings of those woods, trim them down to the proper size and taper, and then lay them aside to season. The dressed poles are about thirty feet long, two to two and a half inches at the butt, and one and a half inches at the other extremity. The oval couch rim is made exclusively of ash, bent into the desired shape while the wood is green. A network of raw-hide is afterward lashed to the rim and completes the bed. The bed is three and a half to four feet in its transverse, and two and a half to three feet in its conjugate diameter. When a travois is to be rigged, two or three Teepee poles, according to size and strength, are selected for each shaft and lashed together, butts to butts, with raw-hide. The system is then lashed to the pack-saddle with the same material, the small ends of the poles trailing on the ground. The Indians sometimes use a breaststrap as an additional stay. The bed, with the longer diameter laid transversely, is next secured to the shafts one foot in rear of the horse, about six inches of each end of the bed being allowed to overlap the shafts. A blanket, piece of canvas, or buffalo robe lashed to the lower half of the oval rim of the bed completes the outfit. When a patient is to be carried, he is laid transversely on the bed, partly reclining on the side, with knees slightly drawn up, and head and shoulders bent forward and secured to the bed by drawing the blanket up over him and lashing it to the upper part of the rim. I made use of ten of these travois to transport the wounded from the battle-field of the Little Big Horn, June 25 and 26, 1876, to the boat at the mouth of the Big Horn. The distance was thirty miles; time of march, night; the country to be traversed rough and broken; the Little Big Horn, which crossed our line of march in its windings toward the Big Horn, had to be forded six times—obstacles enough to test the merits of the travois as a carrier of wounded; yet, notwithstanding the difficulties in the way, the wounded were transported to the boat without accident or personal inconvenience and discomfort of any kind. I was particularly pleased with the results of this trial, and resolved to make



FIG. 28.—Dakota Indian litter. [From a drawing by Dr. J. W. WILLIAMS, U. S. A.]

¹ Brigadier-General A. H. TERRY, with a force of cavalry and infantry numbering about fifteen hundred men, made an expedition into the Sioux country in June, 1876. On June 25th, the advance, consisting of eleven companies of the 7th Cavalry, under Lieutenant-Colonel G. A. CUSTER and Major M. A. RENO, encountered the Indians at the "Little Big Horn," and lost 15 officers, an acting assistant surgeon, and 232 men killed, and 59 men wounded.—See *Annual Report of the Surgeon General*, U. S. A., 1876, p. 13.

a more extended trial of the travois should future occasion offer. I am of the opinion that the travois is well adapted for transporting wounded over a rough country; that it is quite as safe and free from jar as the mule-litter, also resorted to on the same occasion; and that it is by far more economical than the latter in the number of attendants and animals which it requires.¹ In case of an Indian war, when villages are attacked and captured, there never will be any difficulty of obtaining material for building the travois; under different circumstances they will have to be prepared beforehand. My idea was to prepare twenty-five travois and use them as part of the pack-train until needed for transporting wounded. It is well known that the Indians use the travois for carrying all sorts of baggage, and that it is no impediment to rapid marching, and that, further, in case of battle, their wounded are quite as speedily removed from the field by the same means."

Brigadier-General A. H. Terry is of opinion that the following memorandum, by Lieutenant G. C. Doane, 2d Cavalry, for the construction of two-horse litters, will "be of great value to at least every medical officer of the army".²

CAMP ON YELLOWSTONE RIVER, July 11, 1876. To the ASSISTANT ADJUTANT GENERAL, Department of Dakota. (Through official channels.) SIR: In compliance with a verbal request, I have the honor to submit the following memorandum of specifications for the construction of horse or mule litters for the transportation of wounded men in the field: Cut two poles sixteen feet long. These should be of green timber, three inches in diameter at small ends after being barked;



FIG. 29.—Notched three-inch timber.

four inches back from each end, cut a notch (FIG. 29) all around and tie in a loop of strong rope or raw-hide (FIG. 30); the loop to be about four inches aperture. Now lay the poles parallel and with the small end to the front, about three feet apart. For cross-bars take two pieces of pole, same size as above, and each about four feet long; cut notches about two-thirds of the way through one of them, three feet two inches apart, to fit down on the



FIG. 30.—Notched timber with rope.

two poles at right angles; cut with a square shoulder to resist pressure inward (FIG. 31). Lay off from the small end of each parallel a distance of four feet four inches and mark, then tie in the notches downward firmly upon these points. Cut the other cross-bar in the same way, but have the notches three feet six inches apart. Lay off from the large ends of the parallel bars a distance of four feet eight inches, and tie down at these points the rear bar (FIG. 32) firmly as before; this gives a bed seven feet long, three feet two inches wide at one end and three feet six inches at the other, exclusive of thickness of parallel bars. Now take a lariat or raw-hide thong and cord the bed-space in the following manner (FIG. 32): Tie one end



FIG. 31.—Notched cross-bars.



FIG. 32.—Litter of poles and raw-hide. [From Lieut. DOANE's drawing.]

at a corner over a lashing of a cross-bar notch, pass the rope over the opposite parallel bar nine inches advanced from where it is lashed to the cross-bar. The rope comes under the bar behind the first cord and back over it, making a similar turn over and under the other parallel bar eighteen inches from the point of starting; then back, gaining eighteen inches each time, until it reaches and

passes over an intersection of the cross-bar at the other end of the bed; then pass the rope under both parallels and back over the opposite end of the bar, and cord back to the front end as before, dividing each space of eighteen inches, so that when finished the spaces will be nine inches between bearings approximately; the object of a second cording is to counterbalance the strain of the first, which would tend to throw one parallel forward and the other to the rear; draw the cords tightly. The bed is now complete. To fasten the litter on the mule, take for each end of the litter a lariat and coil it in loops long enough to reach over the saddle-seat and half way down on each side of the body of the animal. Fasten the ends in a tie around the middle of the coil; then slip the loops of the coiled lariat at end through the small loops tied at the end of the bars, and over the ends of the bars, slipping back into the notches; the ends of the bars will then hang in the ends of the lariat coil suspended. Now fasten into the small loop at each end of each bar a piece of rope about four feet long, and around each right-hand, or off-side notch, one end of another cord long enough for a belly-band for the mule. The litter is now complete. To put in the mules: lead up the front mule first, the smaller of the two; loose the lariat loops from one end of the shafts; back the mule between them, pass

¹ Surgeon General T. LONGMORE remarks (*Op. cit.*, *Treatise on Transport*, etc., p. 293): "Two-horse litters seem to be conveyances of very doubtful expediency, if expedient at all, under any circumstances. It is a very unprofitable expenditure of labor for two horses to be devoted to the carriage of one sick man, when the same purpose can be more economically accomplished by other means. The comparatively little width of space occupied by such litters give them some advantage in moving along narrow ways through a partially cleared country, but they cannot travel along narrow tracks presenting short turns, such as winding paths with steep acclivities on one side, which are so frequently met with in hilly districts. The conveyance is too long and unyielding for such movement. Again, it is unsuited for any but tolerably level roads. It is destitute of any provision for preserving its level in case of the leading horse elevating the fore part of the long poles, while the hinder part is depressed, or *vice versa*, so that a road presenting either a steep ascent or descent would cause great inconvenience to any invalid in the litter during the act of transportation."

² "HEADQUARTERS DEPARTMENT OF DAKOTA, SAINT PAUL, MINNESOTA, December 7, 1876. To the ASSISTANT ADJUTANT GENERAL, Headquarters Military Division of the Missouri, Chicago, Illinois. SIR: After the action of the 25th of June last, the wounded men of the 7th Cavalry were carried to the Big Horn River in mule-litters constructed by 1st Lieutenant G. C. Doane, 2d Cavalry. These litters answered their purpose admirably, and I think that a knowledge of the manner in which they were constructed would be of great value to at least every medical officer of the army. At my request Lieutenant Doane has prepared a detailed report upon the method of construction used by him. I now have the honor to forward a copy of it, and I suggest that it be submitted to the Surgeon General of the Army. In this connection I desire to call the attention of the Lieutenant General commanding the division to the invaluable services rendered by Lieutenant Doane. I believe that I speak the sentiments of every officer and soldier who served under me in the field during the campaign of last summer, when I say that I feel the most hearty admiration for the zeal, skill, and energy displayed by this accomplished gentleman and soldier. I am, sir, very respectfully, your obedient servant, ADFRED H. TERRY, Brigadier General, commanding."—[Forwarded by the Lieutenant General to the Adjutant General and referred by the latter to the Surgeon General.]

the lariat loop over the seat of the saddle, lifting both shafts equally; slip the detached lariat loop to its place and drop the shafts so that they will hang equally; then tie each short rope at the side into the pommel-bars of the pack-saddle so as to keep the ends of the bars at an equal elevation. Tie the rope for the belly-band on the near side as on the opposite, and let the mule be led a short distance, with the litter dragging, to see if he is gentle. Put in the rear mule the same way except that he is led into the shafts, and the short ropes are tied into the cantle-bars of his saddle and his halter-strap fastened to the rear bar of the bed, short enough, so that he cannot get his head down under it. If the mules make trouble at all, it will be when first hitched up, and many which act badly at first will quiet down when they find they cannot break loose. They should be led around with the litter empty (care being taken to keep the front mule straight in the shafts) to accustom them to the work. To turn the litter, work the mules in *opposite* directions, the front one to the right, and the rear one to the left, or vice versa. To go down hill, hold back on the rear mule; to go up hill, whip up the rear mule; always start the rear mule first. On the road, a man should lead or ride each mule; also a man should walk or ride on each side of the litter to steady it or refasten ropes when required. Such litters will keep up with the cavalry column on the march if properly managed. The litter should be halted as seldom as possible. If one gets out of order it should be passed by the others if practicable, and closed up when fixed. The rear mule should always be unhitched first. Everything about the fastenings must be strong enough, so that if the mules pull in opposite directions they cannot break either the poles or the ropes. No brittle timber should be used that may weigh as much as one hundred and fifty pounds without detriment. The litters can be carried on cavalry horses with cavalry saddles as well as on mules, if the horses are gentle. I have had occasion to use these litters: one, after the Piegan affair in January, 1870; one, in the summer of 1875, to bring Colonel R. B. Marcy, Inspector General, U. S. A., from the Geysers to the Great Falls in the National Park;¹ and nineteen on June 27 to 30, 1876, transporting wounded men of General Custer's command, in the Little Big Horn Valley, Montana Territory. Very respectfully, your obedient servant, G. C. DOANE, 1st Lieut. 2d Cavalry.

A few weeks after these experiences in the command of General Terry,² Surgeon B. A. Clements, U. S. A., joined the co-operating column under General Crook, as Medical Director, and, in December, 1876, made an elaborate report on the operations of the medical department in the conjoined commands, a report³ including many interesting observations on sick-transport, especially after the engagement at Slim Buttes, September 9, 1876. As it was hardly practicable to extract these remarks from the context without injustice to the narrative, at the request of Assistant

¹ In General W. E. STRONG's work, entitled *A Trip to the Yellowstone National Park*, 4to (illustrated), Washington, 1876, it is stated (p. 75) that General R. B. MARCY, accompanying the Secretary of War in a visit to the Geysers, fell ill August 3, 1875, and could not mount his horse, when Lieutenant GUSTAVUS C. DOANE, 2d Cavalry, constructed for him a litter to be carried by two pack-mules. The following day the General rode fifteen miles on the litter, and for five days subsequently occupied it occasionally when horseback riding was too fatiguing. General STRONG gives the following description of this litter: "Two poles, eighteen feet long and four inches in diameter, were lashed together in the centre, for the distance of seven feet, by weaving a network of pack-cord across, and forming a good, strong bed of sufficient width to admit a mule between the poles in front and one behind. The mules are to be fastened to this litter in precisely the same manner that a horse would be attached to the shafts of a buggy, the shafts of the litter being strongly fastened to pack-saddles by means of straps. Upon the bed of the litter a buffalo robe was spread, and upon this a mattress was placed, with plenty of blankets and a pillow. Two of the most gentle and sure-footed mules were selected and hitched in, with a reliable man on the back of each."

² Assistant Surgeon J. W. WILLIAMS, chief medical officer of General TERRY's command, furnished, January 9, 1877, the following memorandum of the arrangements made for the removal of the wounded after the lamentable affair of the Little Big Horn: "On the arrival of the infantry column under Colonel JOHN GIBBON, 7th Infantry, on June 26th, it was imperative that fifty-nine wounded men should be transported to the confluence of the Little Big Horn with the Big Horn, a distance of about thirty miles, where they could be placed on the transport steamer *Far West*. It was of urgency that they should be removed without delay from the immediate vicinity of the battle-field, made intolerable by the unburied bodies of men and horses. General GIBBON suggested transportation by hand-stretchers; Dr. WILLIAMS advised the construction of travois; Lieutenant G. A. DOANE advocated the use of two-mule litters. Specimens of the three varieties of conveyance were made the next day, June 27th, and were used in moving the wounded to a camp about five miles down, on the Little Big Horn. The hand-litters proved useless, for the men employed as bearers broke down, and sufficient relays could not be had. The travois worked well. The double-mule litters were ineffective, except for luggage, for the animals were so restive that the wounded feared to be placed on the litters. The next day, June 28th, new trials were made with the mule-litters and travois, selecting animals from General CLUSTER's pack-train, in which the mules, recently subjected to long and fatiguing marches, were more docile and tractable. After these experiments, on June 29th, General GIBBON directed the construction of additional two-mule litters and travois, and, as fast as they were finished, the mules were exercised in marching with them. On June 30th, 19 of the more severely wounded were placed on the two-mule litters, 10 on travois, and 30 of the less severely wounded on horseback. Each mule-litter was attended by 4 men, one leading the forward mule, one the rear mule, while one walked on either side of the litter to steady the swaying movement of the side poles. Among the gravely wounded on the mule-litters was one amputated at the place of election in the leg, another with a shot perforation of the knee joint, and 4 with penetrating wounds of the chest or abdomen. On nearing the bank of the Big Horn, the leading mule of the litter bearing the amputated man knelt down and the patient rolled off, but was, fortunately, uninjured. Dr. WILLIAMS observed that much vigilance was requisite on the part of men leading the mules, to prevent serious accidents of this description. The travois, on which the wounded were carried transversely to the long side poles (see FIG. 28, p. 21), required the service of but a single attendant; the 10 less seriously wounded men carried on these conveyances all stated that they found this mode of transport easy and comfortable."

³ The "Big Horn and Yellowstone Expedition," reinforced after the affair of the Rosebud, leaving its wagon-train and disabled men at Goose Creek, near the Big Horn Mountains, resumed the offensive, August 5, 1876, the command consisting of "about 1,500 cavalry, 450 infantry, 45 white volunteers, and 240 Snake and Ute Indians," an aggregate of 2,235 rank and file. A train of 240 pack-mules carried the supplies, 2 mules being assigned for medical and hospital stores and appliances. A medicine-chest, additional quantities of essential medicines, plaster, and surgical dressings, and 90 canvas sacking-bottoms for litters, were carried on the mules. There were six medical officers, and each carried instruments and dressings on his horse. On August 10th, a junction was effected with the troops under Brigadier General TERRY. The combined forces marched to the confluence of the Powder River with the Yellowstone, arriving August 17th. Here 34 disabled men were transferred to the steamer *Far West*. Marching northward, many of the men fell sick from the use of alkaline water and exposure to rain and hailstorms, and five of the men were transported on two-mule litters. After long and fatiguing marches, on September 9th an Indian village at Slim Buttes was attacked and captured. There were one man killed, an officer, and 15 men wounded, in this affair. Litters were constructed from the teepee poles, and the march was continued with 15 mule-litters in the ambulance-train. Approaching the Black Hills, the litter-mules struggled with difficulty through the tenacious mud, and some of them fell in crossing streams and ravines; but none of the occupants of the litters received injury. After a most exhausting march, the column reached the Belle Fourche and was joined by a wagon-train. Among the wounded who were carried for many days in mule-litters, in the most inclement weather, and over most difficult country, was one with a shot fracture of the femur put up in a plaster bandage, and an officer amputated at the place of election in the leg.

Surgeon-General C. H. Crane, U. S. A., Surgeon Clements forwarded from Fort Saunders, Wyoming, January 15, 1877, the following memorandum on the construction and management of horse or mule-litters:

"Litters drawn by mules or horses are not to be regarded as a last resort for the transportation of wounded men. On the contrary, they are superior to any other mode of land transportation for certain classes of wounds. These wounds are, especially, gunshot fractures of the bones of the lower extremity and, particularly, of the femur. Mules are preferable to horses, being smaller, more sure-footed, and having a shorter step. Ordinarily, and especially in Indian warfare, the mules will be selected from the pack-train; but in some cases it may be best to select them for this special purpose alone before leaving the supply depot. When not in actual use, the mules are left with the pack-train in charge of the packers. The packers in charge of the litter-mules assist in hitching up and unhitching, and instruct the men in the management of the mules, tying knots, etc., and accompany the litters on the march. The mules selected for each litter should have unequal steps, otherwise a swaying motion is given to the litter. The ordinary pack-saddle, as distinguished from the Mexican or Californian '*aparejo*,' should be used. A litter consists of two poles about four inches in diameter and eighteen feet long; two stretcher-bars or poles, two and a half inches in diameter and three feet long; and a canvas bottom, five and a half feet long and two and a half feet broad, with eyelet-holes at sides and ends, which are to be lashed to the poles with rope. The '*travois*' (so called) is similarly made; but the rear ends of the side-poles rest on the ground, and it is drawn by one mule. Raw-hide may be used in place of canvas, and it can be had, in case of a successful fight, by skinning dead horses or ponies. If the side-poles are less than eighteen feet long, the rear mule cannot see where he puts his feet, and his head will project over the body of the occupant of the litter, and may injure him; and for the same reason the rear mule is more apt to stumble or fall. The litter is best adapted for a rough country, and, for cases of fracture, the '*travois*' (so called) will answer for a level or rolling country and for wounds other than fractures. Six to eight poles, and the same number of stretcher-bars, can be transported on one mule. Twenty-four canvas bottoms can be transported on one mule. The following number of men—mounted—is required: One private for each mule, one corporal for each set of two litters or four travois, one sergeant to each set of six litters or twelve travois, one or more line officers. The officers and men to be detailed from the same company—discipline and efficiency being better secured thereby. A medical officer has general charge of the litter-train, but confines himself to his professional duties and the general direction of the train on the march. A steward and nurses likewise accompany the train on the march. In hitching up and unloading, one man holds the horses of the men of each set of two litters or four travois. The front mule is always led; the rear mule will often move more evenly and more in harmony with the leading mule if left to himself. The rear mule of the empty litter may be detached, and the litter drawn as a travois until needed. The wounded man lies, preferably, facing to the rear. The loaded litters march in rear of the leading column of troops—preferably in rear of the Infantry—and start with the advance. The empty litters march in front of the rear guard, accompanied by a medical officer. Certain troops—preferably Infantry—are designated in orders to protect the litter-train in case of attack en route. The word '*travois*' is used for convenience. I am in doubt as to its orthography, derivation, and true meaning. I have heard mentioned, incidentally, made that Parkman, in some one of his works on the Indian tribes, writes of their carrying their goods and children on '*travaux*.'"

Assistant Surgeon J. H. Patzki, U. S. A., who was assigned to the charge of the wounded of the infantry detachment on this expedition, forwarded from Fort D. A. Russell, January 25, 1877, a report on sick-transport, from which the following extracts are made:

"In Indian warfare wagons and ambulances are usually pushed as far as the nature of the territory will permit, but when the column cuts loose from the train, accompanied only by pack-animals, there is, as a rule, nothing provided to carry the sick and wounded. The surgeon relies on the old, traditional *travée*, or on the mule-litter, which, ordinarily, can easily be extemporized by constructing a bed or seat of blankets, canvas, or raw-hide, between two stout but elastic saplings; the former fastened to one mule and dragged as a kind of sledge, the latter carried between two mules. I confess that the matter of transportation under these circumstances has always caused me much worry; there is nothing on hand except, occasionally, the canvas-bed, rarely the harness, but never, in my experience, the most important part, the poles, which, it is trusted, will be obtained from the timber along the river-banks, on which the hostile camps are usually met, or from the tepee-poles should a village be captured. In the latter case, abandoned *travées*, ready for use, are generally found. A load of barked and seasoned poles could be easily carried by a few mules; but, as a rule, no animals are set apart at the outset for transportation of sick and wounded. When the supplies are reduced by daily consumption, animals become available; but not to the extent one might suppose; as, in the course of the trip, they become progressively weaker, and their loads must be lightened. * * This want of ready transportation was felt during the engagements at the Rosebud, in June, 1876, when the command moved without even a pack-train; it was embarrassing in the extreme to shift the wounded, to secure for them shelter from the fire by mounting them on horses, on which some were supported by comrades mounted behind them, while others were carried in saddle-blankets supported by carbine-slings. * * Ready transportation, available at any moment, is a great desideratum in Indian warfare; it would expedite the movements of the troops, lessen suffering, and reduce the danger of the wounded and dead falling into the hands of the savages. I have no experience with Dr. McElderry's litter; but, in my opinion, the necessary material to quickly construct *travées* or two-mule-litters would meet all that can be desired. Both are excellent in their way; though I confess that I do not share the favorable opinion, amounting in some to enthusiasm, in regard to the *travée* as preferable to the litter. I think the popularity of the former is partly due to the fact that it is the most common conveyance, as saplings of sufficient length to construct mule-litters are not often found, and on account of the easier construction and the fewer animals required; partly to the opinion of the wounded, who glides along with less suffering than anticipated on a rude conveyance upon which he looked with dread; and, finally, to the relief felt by the surgeon when at last he sees his flock safely stretched on the *travées* and keeping pace with the troops. * * Its Indian origin also lends the *travée*, in the eye of the novice, a certain charm.

From personal experience, and from conversation with the wounded, I consider the *travée* decidedly inferior to the litter. The patients are comfortably carried in the latter, if properly constructed and provided with a hood; and, especially, if so arranged that the rear animal can see the ground and pick his way; and, if the animals are well selected as to gait and temper, and carefully led across the gulches and obstructions, to prevent the rear animal from jamming against the one in front. They have the additional advantage of allowing suspension of the fractured limbs and carrying some medicines and dressings in them, while streams of moderate depth are crossed with less difficulty than with *travées*. In deep snow, on account of the plunging and stumbling of the animals, hampered by the litter, and on account of the smooth gliding of the *travée*, I would prefer the latter. Perhaps, also, in the rare instance where the trail is abruptly winding the greater length of the litter may become a hindrance. The *travée* has the advantage, that its rear end can be lifted and carried over obstructions. I have found that wounds of the trunk, and even fractures of the thigh, if well dressed in plaster, are less painfully carried in *travées* than injuries of the head and fractures below the knee, as patients suffering with the last-named injuries are more distressed by the jarring and bumping, and by contact of the feet with the ground. If the poles are unduly slender and elastic, or the canvas too baggy, the patient is apt to have the greater part of the bed come in contact with the ground, especially if this be uneven or covered with brush. Weak, fainting patients are apt to collapse into a heap and to be dragged, or possibly dropped out, through the carelessness of nurses, as I have witnessed. In the litter, the patient can easily be secured by surcingle. Fractures of the upper extremities, well splinted or bandaged against the trunk, are best carried on horseback, as are all slighter injuries. Of course, where poles of sufficient length or the necessary number of animals cannot be obtained, then the *travée*, the simplest but rudest possible conveyance, is the last refuge; it enables the surgeon to drag his wounded along dead or alive, but the groans or set faces of the sufferers betray that they are not on a bed of roses. Some say that *travées* are more comfortable than even ambulances; this is not borne out by my experience; but, I think, the litters are; not, however, more so than ordinary hand-litters, or hammocks slung in wagons or ambulances. The *travée*, as I have seen it, constructed by our troops, is decidedly inferior to the Indian original. The latter is usually hooded with wicker-work; the poles are well-seasoned, longer, lighter, and more elastic; they converge at their lower extremity instead of diverging, thus preventing somewhat the sliding down of the patient; the seat or bed is of platted raw-hide covered with a robe, less baggy than blankets or canvas. In these, with their intimate knowledge of their territory, Indians carry their sick and wounded with comparative comfort over the short distances they ordinarily travel when changing camp for grass or game. I have noticed that they carry fractures of the leg on horseback, the limb dressed in their willow-splints,—similar but inferior to our co-aptation splints,—and suspended from the pommel of the saddle."

Acting Assistant Surgeon V. T. McGillicuddy, who immediately supervised the transport of the wounded carried on *travées* in this expedition, visited the Army Medical Museum November 15, 1876, and presented a miniature model of such an appliance attached to a horse. In this model, numbered 813 in Section VI, the ultimate limit of simplicity is aimed at. The draughtsman has tried to represent it in the adjacent wood-cut (FIG. 33). A sacking-bottom is lashed to two poles that are separated by traverses, and secured to the stirrup leathers of a cavalry horse equipped with the regulation saddle. The soldier's pack makes a pillow, and a blanket is thrown over him. Dr. McGillicuddy has communicated an account of the results of his observations on the utility of this form of drag, with comments on its merits when compared with the two-horse litter. Extracts are subjoined of such portions of this paper as has not been anticipated by previous reports. It is dated Camp Robinson, Nebraska, January 27, 1877:



FIG. 33.—*Travée* or Indian horse-litter as figured by Dr. MCGILLYCUDDY.

* * "I have the honor to submit the following report on the comparative merits of the travois and two-horse litter as means of transportation for sick and wounded in service on the frontier. In reports heretofore rendered, more or less confusion has arisen from the indiscriminate application of the term horse-litter to both of these conveyances, whereas they are totally different, each having its own peculiar advantages and disadvantages. The horse-litter (properly speaking) is a two-animal arrangement, and is substantially the same as the ordinary hand-litter, or stretcher, in use in the army, either horses or mules being substituted for the men, who act as stretcher-bearers, one animal being harnessed between the poles before and the second between the poles behind; the patient being placed on a piece of canvas or other material, stretched between the poles in the intermediate space. The *travor*, *travoir*, *travois*, *traveau*, *travaise*, or *travail* (as it is variously spelled), is, on the contrary, not a litter or stretcher in the way it is used. * * The animal being hitched between the poles in front, the after ends of the poles rest on the ground and act as runners, the patient resting on canvas stretched between the poles in the rear

of the animal. In fact, the horse-litter is *carried* by the animals, while the travois is *drawn*. Sometimes two animals are used with the travois, harnessed in tandem; but, in my experience, I find one animal sufficient for the load for any ordinary march, even in a rough country. * * The travois may have been employed years ago by our medical officers on the frontier; but it certainly never was used so extensively nor brought before the public so prominently, as during the present Sioux war. I had good opportunities for observing the comparative advantages of the travois over the horse-litter while on the Big Horn expedition during the past summer, especially after the engagement at Slim Buttes, when I was placed in charge of the transport of the wounded by Surgeon Clements. For transportation I employed nine travois and three two-horse litters, and carried the wounded a distance of about eighty miles, from the field to the northern portion of the Black Hills, where wagons were procured. Our route was over a portion of country untravelled, and in some places very much broken and hilly, and, in other parts, very difficult on account of the numerous small streams, which made the ground very soft and almost impassable, even for cavalry. One objection to the two-horse litter is, that two animals are always required with two men to each animal, one to lead the other to drive. So, to transport one patient, two animals and four men are required. With a travois, but one animal and two men are necessary. With the two-horse litter, if the leading wishes to travel a little more rapidly than the after animal, one or other animal is apt to pull or be pulled out of the harness, and the litter come to the ground either by the foot or head, causing the animal that remains attached to be frightened, which results in more or less damage to the vehicle and patient; on the contrary, if the after animal hastens a little, then there is apt to be a collapse. If one of the animals stumbles and falls down, either the other has to come also or the conveyance is broken, and the person carried thrown out. There is another objection to the two-horse litter; if both animals keep step, the litter begins to vibrate, from the regularity of the motion, and increases to such a degree as to almost throw the patient out. It is for this reason that men employed as stretcher-bearers have to break step; if, on the other hand, the animals break step, the result is a kind of a compound joggling motion which is very unpleasant to the occupant of the litter. I find it necessary to carry long straps around the litter and patient, to prevent his being bounced out. If the animals become unmanageable, and the patient is by any means thrown out, or throws himself out, he has a long distance to fall, and is apt to sustain further injuries. In crossing soft swampy ground, should the animals get to floundering, they being both fastened to the same conveyance seriously interfere with each other, which renders them entirely unmanageable. Besides, owing to the peculiar manner in which the rear animal is fastened to the litter, it is impossible for him to regain his feet. The litter cutting off the sight of the ground from the rear animal, makes him particularly liable to stumble. In fact, in being forced to use two animals in the litter, the liability to accident and trouble is more than doubled, without a corresponding amount of benefit resulting. The travois, on the contrary, is easily constructed, requires but one animal and only one man to manage. Should the horse or mule for any reason become unmanageable, the patient has only to roll off, being but a few inches from the ground, and therefore runs very little risk of being injured. On moderately smooth ground I have frequently traveled with the travée at a trot, without inconveniencing the patient, a thing impossible to do with a two-horse litter. In view of these facts, I consider the travée in every way preferable to the horse-litter, and, unless over good roads, it is preferable to the ambulance-wagon. I have heard patients, after having been transferred to the wagons, wish themselves back to the travée. As I have before remarked, the travée is very easy of construction, and with a limited supply of tools, finding myself one day several miles in the rear of the column with a sick officer unable to travel on horse-back, I succeeded in constructing a very comfortable travée in the course of an hour, using small pine trees for poles, and interlacing the lariats of the horses between the poles for the support of the patient; in this case the only tools available were our belt-knives."

Assistant Surgeon J. R. Gibson, U. S. A., on returning from the Powder River expedition¹ against the Sioux in November and December, 1876, transmitted from Fort McPherson, Nebraska, January 24, 1877, the following observations:

* * "The old traditional travois, with its rude construction and apparent imperfections, is, in reality, a great boon. It is open to objections; but, when the nature of the service, character of the country, and limited facilities are taken into consideration, the travois comes prominently forward as the means, *par excellence*, for the transport of the disabled. It is not equally well adapted to all the emergencies incident to Indian warfare; for, in many cases, doubtless grave perplexities would arise, as, for instance, in shot fractures of the lower extremities; here its advantage is questionable. Yet, in the last campaign, two cases, one shot-fracture of the upper thigh and one involving the hip-joint, were carried for a distance of fifty or sixty miles, from battle-field to supply-camp, with the utmost comfort. These patients were in plaster of Paris dressings. In fact, on their subsequent transfer to ambulance wagons or to swinging litters in army wagons, their expressed preferences for the travois were most pronounced. * * The two-mule litter was not used in the Powder Run expedition. My experience with it is very limited, having seen it used in but one instance several years since. The objection to it consists in the difficulty of securing animals uniformly gaited, in the liability of the rear mule falling or being dragged by the lead mule; also in the varying deviations from a plane surface which the litter describes in traversing very abrupt country. It has also some advantages; for instance, in crossing fordable streams and swift currents the patient's position is far more secure and comfortable than on the travois, the latter necessitating the services of attendants to secure the free ends of the drag, and to wade the streams carrying their burden. The rate of travel attainable by mule-litter is much greater than by travois. The drag-litter is readily prepared from materials at hand; white-pine saplings are the poles, and canvas stretched on them forms the bed. The Indians use raw-hide or robes. Oftentimes the Indian litter is found ready for use in a captured village. * * The use of the modern expedients, with their elegant appliances, harness, gear, etc., seem to me to be excluded simply for the reason that, in such campaigns, the number of pack-animals is usually limited. If the number sufficient to transport medical supplies alone is furnished, the medical officer

¹ The "Powder River Expedition" against the Sioux, under the command of Brigadier General G. CROOK, commenced November 14, 1876, and terminated December 29, 1876. The expeditionary force consisted of eleven companies of cavalry, four of artillery, and eleven of infantry, an aggregate of 74 officers, 1,441 enlisted men, with 355 friendly Shoshone, Pawnee, and Arapahoe scouts. November 25, 1876, Colonel R. MACKENZIE, 4th Cavalry, attacked and captured a Cheyenne village on the north fork of the Powder River, on Bates Creek, and lost six killed and twenty-seven wounded.

may consider himself fortunate. A mule can be utilized in two ways: he goes out packed with commissary supplies, which, when consumed, make the animal, with his pack-saddle, available for emergencies,—he generally returns the bearer of a litter. Of course it would be desirable to have the means of transportation of sick and wounded entirely and solely under medical direction. The animals should be previously selected, accustomed to their harness and new duties; also, they should, from the start, be reserved for this service alone.¹ By this means the transportation of pack-saddles, harness, etc., is secured, otherwise it would prove a matter of no little difficulty and annoyance to have the gearing and poles of perhaps thirty to forty litters carried. For the above-cited reasons, chiefly, I consider the improvised litter preferable to more modern appliances."

Assistant Surgeon D. L. Huntington, U. S. A., who has had much frontier experience, has kindly furnished the reporter, from Soldiers' Home, Washington, January 18, 1877, the following remarks on army sick-transport under conditions of exigency:

"Such experience as I have had on the frontier and in the midst of hostile Indian tribes leads me to the conclusion that all the common forms of apparatus for transporting badly wounded men under circumstances where wheeled vehicles cannot be used are serviceable and useful; the circumstances and peculiarities of any given situation giving to each form of apparatus its particular value. Under the widely varying geographical diversity of our country, I doubt the possibility of determining upon any one apparatus which shall be equally serviceable in all places and under all conditions. The necessarily irregular and peculiar warfare waged with hostile Indians renders it impracticable, in many cases, to properly fit out a scout for an emergency with all that is desirable for the contingencies of action; and it often happens that, most unexpectedly, and in the most inopportune places, the ingenuity of a medical officer is taxed to the utmost to provide transportation for a man wounded in a sudden Indian attack, or injured by accident at a distance from camp or settlement. Even with expeditions fitted out for the express purpose of seeking and fighting Indians, the character of the country often presents such obstacles to the use of the ordinary conveyances for the wounded, that the medical officer is perplexed to know what material even can be taken, which may be serviceable in fitting up transport apparatus when needed. Again, it not unfrequently happens that in the hot pursuit of Indians who are seeking safety in almost inaccessible mountains and cañons, it is necessary to abandon, for a time, the pack-trains and follow the enemy in the lightest order. In such situations, the transport of an unfortunate wounded man to the base of supplies is a difficult and dangerous matter, and the medical officer is here required at once to suggest and practically carry out some plan that will ensure the safe removal of the man. Under such circumstances, I was once obliged to transport a soldier, wounded in the abdomen, a distance of twelve miles along the narrow bed of a creek filled with boulders and obstructions. I was fortunate enough to find two ash-saplings which, with a blanket stretched across, made an improvised litter, on which my patient was borne, by relays of men, with comparative ease and comfort. At another time, a man belonging to a small detachment sent out from a scouting party was wounded in the leg by the accidental discharge of a musket. Finding it impossible to place the man on horseback, and unsafe to detach a small party to seek the main command, his comrades carried him a distance of about three miles, by forming a seat with their hands and arms, similar to the chairs made by children in their games (FIG. 34). During the late war, I saw a soldier, who had been wounded at some distance from his command, conveyed to a place of safety by laying him prone across a saddle, the stirrup of one side being sufficiently lengthened to afford support for one foot. The horse with his burden was then led quite a distance. I am familiar with another instance, where a man, badly wounded, was conveyed about a three-days' journey in a cot or hammock formed by securing a blanket to two lariat ropes; the ends of the ropes were gathered and carried by his comrades on horseback. All military surgeons know of instances where wounded men have been carried from the battle-field on muskets with an overcoat laid upon them for a bed. Under the urgent demands of necessity, the fruits of ingenuity are sure to come to the rescue. Of the usual apparatus for conveying wounded, the ordinary hand-litter is the simplest and generally the most useful in the greater number of cases, particularly when the command is large and the distance to be travelled not excessive. It can be easily secured to a pack-saddle, and, with a little attention from the mule driver, it may be safely carried a long journey. If it becomes necessary to penetrate cañons or ravines, impracticable for the train, it can be carried on men's shoulders. If called into requisition for transport for long distances, it must, of course, be carried by relays of men. Over rough country, it is the easiest and most comfortable mode of conveyance for the wounded, although laborious and fatiguing to the command. The litter for two mules is a comfortable and easy mode of conveyance, provided the mules are quiet and have been trained to its use; otherwise, the unsteady motion and frequent jerks, cause much pain to the sufferer. It is inapplicable over very rough country, and in narrow-winding mountain trails or in densely-wooded and unbroken country. The *travée* is a common and familiar mode of conveyance, easily improvised, and not uncomfortable. The side-poles for its construction may be carried with any pack-train in the manner in which the Indians carry their lodge-poles. The most favorable condition for its use is over plain country. In rough country, and in mountains, it is dangerous. I have had no experience with the *cacolet*; but doubt if it would be of much service with the small mule so common in the West and over mountain trails. Judging from the description of such mounted litters for one mule as have been successfully employed on several occasions, I should think that probably future experience will succeed in perfecting it to such an extent as to make it a very desirable conveyance for general use. Even a limited experience in the Indian country will serve to bring out all the latent ingenuity of a medical officer in devising apparatus suitable to the end to be attained; and he will at once learn the value of such material as can be readily carried by man or beast, as rope, buckskin thongs, and blankets."



FIG. 34.—Seat made by clasping arms.

¹ The British *Military Train Manual* (1862, p. 37) remarks, in the directions for *Loading of Pack-Animals*, "Great judgment is required in loading pack-animals, and care should be taken that the animals are not over-weighted, that the load is well put on, that it is neither pitched too high upon the saddle, thereby causing it to roll upon the back, nor too low, which adds to the weight and encumbers the animal, but that the lower line of the load should be even with the shoulders."

Assistant Surgeon-General C. H. Crane, U. S. A., has noted a curious expedient by which, in the absence of any regular appliances, a wounded man was transported a long distance in the mountainous regions of Oregon:

"I believe that the nature of the country where troops are operating against Indians must determine the question as to the best way of transporting the wounded men; and that there will generally be found in the command sufficient ingenuity and means to successfully overcome all obstacles, and to devise and carry out the most appropriate methods of transport. I have had occasion, during several Indian campaigns in California and Oregon, to use litters for carrying wounded men over difficult mountain-trails; in one instance, for a distance of forty or fifty miles. This difficult and tedious undertaking was accomplished by hand-litters, constructed on the spot, from such material as happened to be available, generally by lashing canvas or thongs of raw-hide to poles cut in the woods. I have never used the so-called *travée* or traversine, or Indian litter; I have seen a wounded man safely carried by his comrades for a distance of over fifty miles, along bad mountain-trails, packed on an *aparejo* on a mule's back. He was placed in a semi-recumbent position facing the mule's tail, reclining in the frame of an old trunk, from which the lid and one end had been removed. His wound was from a rifle-bullet that had perforated the muscles of the upper third of the thigh without touching the femur. It was so painful that he could not be carried in the usual way, on horseback, as I have seen safely done in several other instances of shot wounds in the same location."

In an endorsement on the papers relating to the Rooker saddle attachment, General W. T. Sherman makes the following observations on the transport of wounded in cases of emergency:¹

"When wagons are present or near they are, of course, the best possible, because the wounded man can be placed in a position for carriage by the surgeon in charge, according to the nature of the wound. When there are no wagons, the stretcher improvised on the spot out of blankets and poles is the best possible, carried by men or arranged to a horse, like the lodge-poles of the Sioux. These are better than this saddle. A wounded man, ninety-nine times out of the hundred, wants a recumbent position as soon as possible. If the occasion does not admit of this, then he must be carried on the back of a man, or on a horse, with a comrade behind him to support him and guide the horse. All sorts of saddles have been tried for carrying wounded men, but as a rule they are always left behind, and though I would not discourage the inventive genius and efforts of men humanely disposed, I would trust to the ingenuity of the officer and surgeon on the spot. Mr. Rooker's saddle seems to have been issued to General Custer and others competent to judge, and the only answers I find in this series of papers are that of Captain Mix, 2d Cavalry, and of Dr. Maghee, both of which are unfavorable. This matter, as well as others of a similar nature, may well be left to the ingenuity of the troops interested, who are fully qualified to take care of themselves in all the contingencies of war."

Notwithstanding the opinions of officers of distinction and of large practical experience, I am unable to convince myself that it is prudent or economical to confide the matter of sick-transport to the ingenuity of troops. Because there will generally be found in military commands sufficient ingenuity to construct a bridge, it is not considered expedient for the engineers to neglect the study of trestles and pontoons; and whatever aptitude the men may have for foraging, a regulated administration of commissary, quartermaster, and ordnance supplies is deemed essential. So, likewise, in the medical service of armies, if the difficult problems concerning the transport of sick and wounded men, with due care for the safety of their lives and alleviation of their sufferings, are not studied out in advance, there will be great detriment, on numerous occasions in campaigning, to the efficiency of the fighting force.² Experience having demonstrated that, in our army, some other mode of transport than by hand-litters and wheel-vehicles is imperatively necessary, it is

¹ Captain A. MOORE, 3d Cavalry, October 3, 1872, forwarded, from Fort McPherson, Nebraska, to the headquarters of the Department of the Platte, a memorandum in regard to the equipment necessary for the successful working of a pack-train to accompany expeditions against Indians, containing in substance the following practical hints: A thoroughly qualified chief packer should be engaged with two or four assistants, according to the duration of the proposed scout. He sees that the *aparejos* are properly fitted to the mules, which takes time and care. An *aparejo* fitted to a small mule, such as are used in Arizona and New Mexico, should not weigh over 18 pounds. In the Department of the Platte, where American mules are used, the weight of the *aparejo* should not exceed 22 pounds. The packer and his assistants should put on and off the *aparejo*, carefully attending to galls or sores on the pack-animal's back. He should forbid the blankets of the pack-animal from being used as bedding, and see that the dock or crupper is kept clean and well greased, as pack-mules in a mountainous country suffer more from lacerated tails than from any other injury. He should daily equalize the packs, favoring the weaker animals. The *aparejos* furnished in the Department of the Platte were not properly fitted to the mules. To procure competent packers Captain MOORE believed it to be necessary to send to Oregon, Idaho, Nevada, or Arizona, where the roughness of the country precludes the use of wagons. Captain MOORE states that he had used *aparejos* on Indian expeditions almost continuously since 1867, and was convinced of their superiority to other pack-saddles. In December, 1871, Captain MOORE turned over at Tucson a train of mules in perfect order, that had followed his company over 4,000 miles in less than a year, bearing packs on the *aparejo*. In forwarding the report of which the foregoing is a brief abstract, Brigadier-General E. O. C. ORD remarks that the "Mexican *aparejo* is much used throughout Mexico, California, and the mountains of Nevada, Arizona, and Utah, and that no intelligent packer will allow an old-style pack-saddle to gall his mules if he had means to make, buy, beg, borrow, or steal a decent *aparejo*." * * Lieutenant-General P. H. SHERIDAN, in transmitting the report, remarks: * * "There has been a great variety of opinions as to the relative value of pack-saddles. If a corps of Mexican packers are to be used, it is absolutely necessary to have *aparejos*, because that is the instrument which is their beau idéal, and there is no people so celebrated for beastly mule-cruelty as the Mexicans. When mules follow a scouting party which travels at a rapid gait, to keep their backs well is a difficult thing, and no odds how well adjusted the saddle may be when the mule starts out, in a few days, the fatigue and loss of flesh destroys the first adjustment of the saddle to the pack. I have packed extensively with skilful Mexican and American packers, with *aparejos* and pack-saddles, and have found the condition of the mules and the condition of their backs to depend very much upon the speed with which they were driven, and the roughness or smoothness of the country over which they travel."

² To such an extent that in several of the expeditions against Indians in 1876, four men and two animals were subtracted from the effective force for every man sick or wounded, a most unprofitable expenditure of labor.

important to determine the best method. Assuredly this cannot be the devotion of two animals and four soldiers to the carriage of one sick man. It is known that in countries varying in climate and geographical configuration as widely as Algeria, Russia, Italy, and Mexico,¹ it has been found possible to transport two wounded men by one mule, and that only one muleteer was needed for every two mules. The utility and economy of such an arrangement are so obvious, that, notwithstanding the expense and systematic care required to provide animals of sufficient strength and docility and men adequately instructed in the training of the animals and care of the wounded, it would be feasible and desirable to renew the attempt to secure its advantages, as has been successfully accomplished in other armies. It is probable that, with suitable pack-animals² and trained hospital men, the advantages in comfort and economy of perfected cacolets³ and litters over rude improvisations,^{4 5} however ingenious, would be recognized. In a shipwreck, one admires the ingenu-

¹ It has already been noticed (*ante*, p. 12) that the French invading force in Mexico, in 1865, took with them the ambulance-mules that had formerly served in Algeria, and had no difficulty in carrying two sick or wounded men on each; while the Austrians, provided with similar cacolets and litters, but without competent muleteers, or any animals but those procured in Mexico, failed wretchedly in their sick-transport. It would be presumptuous to propound a definite plan for sick-transport for our army for circumstances where wheeled-vehicles and water-transportation are unavailable, while the expressed opinions of experienced officers are so divergent, and old methods have repeatedly failed; but as steps in the right direction, it might be suggested that troops operating in frontier regions, and dependent on pack-trains for their supplies, should be accompanied not only by farriers, packers, and commissary and ordnance employés, but by hospital-men or infirmarians familiar with the handling of the sick and wounded, and capable of utilizing the means provided for their transport; and also by trained mules or ponies fit for ambulance-transport. Both men and animals could render other services until their special functions were called in requisition. Could even a small body of trained hospital men be distributed through the detachments of the army, they would serve as fuglemen, to drill two or more detailed men in each company in the duties requisite in emergencies for the care of the sick and wounded, and would constitute a corps of enlisted men from which competent hospital stewards could be recruited.

² The burden a mule can sustain continuously varies much, according to the breed or strain, as well as in individuals. "A good Spanish mule, of proper age, is said to be able to travel several months continuously with a weight of some six to eight hundred weight on its back; but only the best, full-sized, and well-limbed animals can accomplish this task. (LONGMORE, *op. cit.*, p. 268). In the "*Voyage of the Beagle*," Mr. DARWIN mentions, with regard to South American mules, that it is the custom for each animal in a troop to carry a weight of 416 pounds when the ground is level; but that in a mountainous country the mule's load is only about 300 pounds. Dr. NEUDÖRFER (*Handbuch der Kriegschir.*, 1867, B. I, p. 341) states, that the largest and strongest mules that could be obtained in Mexico by the Austrian expeditionary force in 1864-65, broke down under a weight of four hundred pounds. LORD and BAINES (*Shifts and Expedients of Camp Life*, London, 1871, p. 468) assert: "About 140 pounds is about as much as a mule of average power can travel well with from day to day," meaning probably the load in addition to the pack-saddle and accoutrement. They prefer animals of comparatively small size, and mare mules to horse mules as more tractable. "Baggage mules abound in some of the mountainous parts of Eastern India, but they cannot be turned to account for the carriage of European cacolets and litières with a couple of sick or wounded men upon them. They have not the requisite size or strength. They were tried for this purpose experimentally at Huzara, in 1854, by Captain HUGHES, commanding the Peshawur Mountain Battery, but were found to be quite incapable of sustaining such a load. These mules are thoroughly efficient for the tasks they have to perform, for carrying supplies over rocky and precipitous defiles, or in the interior of a country where there are no roads, because their loads are properly proportioned to their size and power of endurance; but only a mule that is capable of carrying without distress a weight of from four hundred pounds to five hundred pounds can do the work required in the European mode of sick-transport, and any attempt to get mules of less power to perform this service satisfactorily must always end in disappointment and loss."—LONGMORE, *op. cit.*, p. 269. Pack, in commerce, denotes a quantity of goods made up in loads or bales for carriage (RENA's *Cyclopædia*, Am. ed., Vol. XXVII): "A pack of wool is a horse's load, containing seventeen stone and two pounds, or two hundred and forty pounds weight." In the Report of G. B. MCCLELLAN it is stated (*op. cit.*, p. 25) that in the Prussian service the normal load of a pack-animal was then (1855) estimated at two hundred and four pounds.

³ The derivation of the term *cacolet* is doubtful. M. LITTRÉ (*Dictionnaire de la Langue Française*, T. I, p. 449) says: "Mot usité dans les Pyrénées." It has been suggested, according to Professor LONGMORE (*op. cit.*, p. 272), that the word may be derived from the resemblance in principle of the mule-chair to the arrangement for carrying milk in casks slung on a mule (*édque au lait*), employed by the peasantry in the south of France, where mule-litters and chairs were first provided, as a part of the ambulance outfit for the troops on their way to Algeria. It has also been supposed that "cacolet" is simply a corruption of "cabriolet," which originally denoted a sort of little arm-chair. It seems probable that the word was of local use in the Pyrenees to designate the burden of a pack-animal. The eminent Russian surgeon PIRGOFF commends the cacolet (*Grundzüge der Allgemeinen Kriegschirurgie*, 1864, p. 42): "In the Caucasus, I tested several times the Algerian transport saddle and chair. I conveyed in the same, on horses, through the narrow defiles of Dagestan, several wounded with compound fractures of the leg, after having secured the injured limb in paste bandages. The transported men found this mode very comfortable."

⁴ An abstract from F. JAGON's *Travels in the Philippines* (London, Chapman & Hall, 1876) is given in *Harper's New Monthly Magazine*, for December, 1876 (Vol. LIV, p. 78), and contains, among its numerous illustrations, a drawing of a Pavava (FIG. 35), a conveyance drawn by a buffalo, and employed by the country people about Manila. The shafts, frame-work, and body are of bamboo; the collar and nose-band of the buffalo of chair cane, and the roof of pandanus leaves. This arrangement furnishes a hint for making travées more comfortable. Unhappily the bamboo, admirably suited to the construction of litters and stretchers, is not available in this country. RÖDLICH (*Entwurf zu einer sowohl für den Frieden als Kriegszustand dauernd bleibenden Transportirungs-anstalt für Kranke und Verwundete*, Aachen, 1815), has proposed to suspend a large litter for two or more wounded between two oxen, as in FIG. 36; but he considers this expedient unlikely to be of general application, since the movements of oxen are very slow, unfitting them for purposes of military transport.



FIG. 35.—Pavava used in the Philippine Islands.



FIG. 36.—Bullock litter. [After H. FISCHER.]

⁵ Early references to the Indian drag or litter use the word "travail" (plural *travaux*), a term possibly applied, by metonymy, to a labor-saving appliance. It seems more probable, however, that the early French voyageurs and missionaries who visited the western wilderness gave to this contrivance the name of *travée*, with reference to the poles held apart by *traverses*. *Travée*, according to LITTRÉ (*op. cit.*, T. IV, p. 2325), denotes two side-posts connected by cross-pieces. The various corruptions of the term, *travois*, etc., are probably Indian *patois*.

ity and intrepidity with which sailors construct a raft, yet does not hold the commander blameless if he has neglected the precaution of life-boats. It may be assumed that, to introduce in our army a system of sick-transport on pack-animals, it is requisite to provide suitable mules or ponies and men skilled in packing them. Opinions of officers charged with trains appear to incline in favor of the *aparejo* in preference to other forms of pack-saddle. Major-General Schofield, April 10, 1874, promulgated a set of instructions by the lamented Lieutenant Grant,¹ on the mode of pre-

¹ *Remarks on preparing and packing the aparejo.* By Lieutenant ALEXANDER GRANT, 1st Cavalry: "The most suitable size of the *aparejo* is four feet nine inches long by two feet wide. To set up an *aparejo*, prepare straight smooth sticks from one-half to one inch in diameter (wild-rose stems are the best, but any tough, elastic wood will answer), and the coarsest grass that can be obtained. The grass should be cut green, free from flower-stalks,

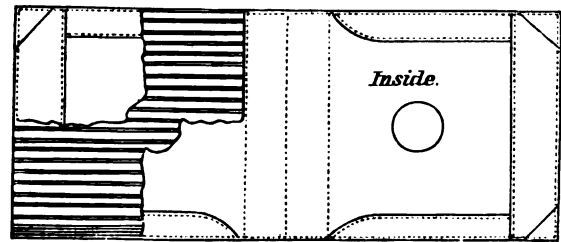


FIG. 37.—Interior view of aparejo.—[GRANT.]

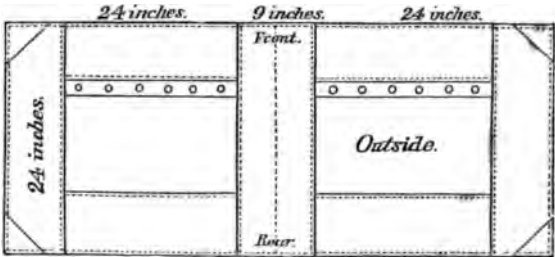


FIG. 38.—Exterior view of aparejo.—[GRANT.]

and dried slowly in the shade. Place the *aparejo* outside down, as in FIG. 37, shake the grass thoroughly, and place layer after layer on the sticks until the compartment is as full as it can be stuffed with the hand. Great care is necessary in order to insure an equal distribution of the grass in the compartment. The corners are stuffed as hard as possible, a sharp stick being used for the purpose. When stuffed the compartment should have uniform thickness, and when the *aparejo* is stuffed it should be put on the mule, and the crupper adjusted (FIG. 39). The *aparejo*-cinch (FIG. 41) is made of strong canvas, seventy-two inches long and twenty inches wide, folded so as to bring the edges in the centre of the cinch. The edges are stitched together, as shown in FIG. 41. A semicircular piece of strong leather, pierced with two holes, is stitched on one end, and two loops of strong leather on the other. A slider of hard wood, of the form shown in the figure, is placed in the loops, and a ring two inches in diameter is attached to the semicircular piece of leather by a thong. The latigo-strap is of strong bridle leather seventy-two inches long, an inch and a half wide on one end, and tapering to half an inch at the other. The wider end has holes punched in it, as shown in the figure. A saddle-blanket, of the pattern issued by the Quartermaster's Department, is first placed on the mule, and on this a corona or upper saddle-blanket, made of two or three folds of old blanket stitched together, with the mule's number stitched on it in colored cloth. Two men put the *aparejo* on the mule,—No. 1 placing it well back; No. 2 turning down the crupper, passing it under the tail, and then assisting No. 1 to push the *aparejo* forward as far as it will go. A hammer-cloth, made of matting or canvas of a size to exactly cover the *aparejo*, is now laid on. The hammer-cloth has two pieces of hard wood (see FIG. 40), twenty inches long, two inches wide, an inch and a half thick, flat on one side, beveled to an edge at the ends, with leather caps stitched over the ends. No. 1 passes the *aparejo*-cinch to the off-side until the slider-end will reach to the middle of the mule's belly; he then, assisted by No. 2, passes the latigo-strap from above over the slider, then from the outside through the ring, and again over the slider, drawing it tight. No. 2 now reaches over the mule's neck, seizing the front corners of the *aparejo*, drawing them forward and upward, No. 1 at the same time pulling on the latigo-strap. When the *aparejo* is set—that is, when the cinch is tight enough to prevent it slipping—No. 2 passes around to the near side of the mule. No. 1 places his left knee against the *aparejo*, his left hand as far down on the latigo-strap as possible, his right six inches from his left. No. 2, facing No. 1, places his right knee against the *aparejo*, his right hand between No. 1's hands and his left hand close to No. 1's right, and both draw on the latigo-strap, moving their hands forward as the cinch is tightened, when No. 1 passes a double of the latigo-strap through the loop on the cinch and draws it tight. The packers are provided with a sling-rope of half-inch hemp, sixteen feet long, and a lash-rope thirty-six feet long, one end spliced to a ring in the pack-cinch. This cinch is of strong canvas, thirty-three inches long by eleven inches wide, doubled so as to bring the selvages in the middle of the cinch, where they are stitched as in the *aparejo*-cinch. Two rectangular pieces of strong leather eight inches long by five and one-half inches wide are stitched on one end on either side. They are of the forms shown at a, b, FIG. 42. A

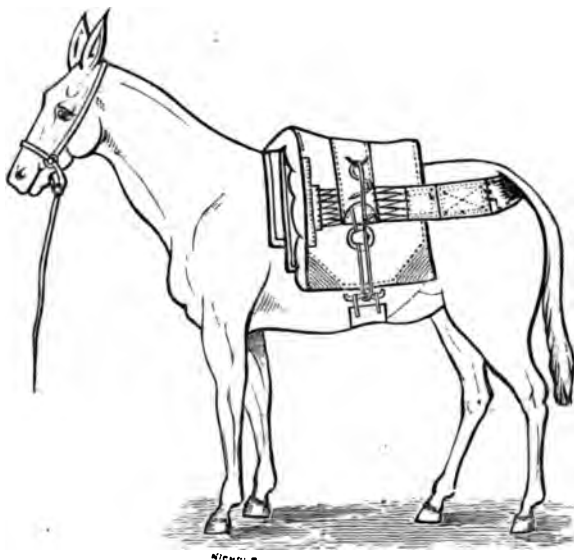


FIG. 39.—Aparejo, with crupper.—[GRANT.]

against the *aparejo*, his left hand as far down on the latigo-strap as possible, his right six inches from his left. No. 2, facing No. 1, places his right knee against the *aparejo*, his right hand between No. 1's hands and his left hand close to No. 1's right, and both draw on the latigo-strap, moving their hands forward as the cinch is tightened, when No. 1 passes a double of the latigo-strap through the loop on the cinch and draws it tight. The packers are provided with a sling-rope of half-inch hemp, sixteen feet long, and a lash-rope thirty-six feet long, one end spliced to a ring in the pack-cinch. This cinch is of strong canvas, thirty-three inches long by eleven inches wide, doubled so as to bring the selvages in the middle of the cinch, where they are stitched as in the *aparejo*-cinch. Two rectangular pieces of strong leather eight inches long by five and one-half inches wide are stitched on one end on either side. They are of the forms shown at a, b, FIG. 42. A

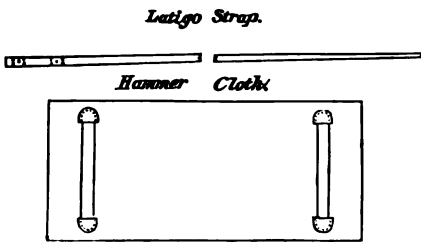


FIG. 40.—Hammer-cloth and Latigo-strap.—[GRANT.]

piece of strong leather is cut of the form shown at c, FIG. 42, the circles being five and one-half inches in diameter. A ring three inches in diameter is placed between the circles, and these are folded on each other with the canvas cinch between them, and the whole firmly stitched together. The hook is made of hard wood of the form shown at d, FIG. 42. It is passed through the slit in the rectangular piece of leather, and firmly fastened with a leather thong. In putting on the pack No. 1 takes the sling-rope, doubles it, and passes the loop well over on the off-side; No. 2 raises the part of the load intended for his side of the pack and places it well up on the *aparejo*, holding it there with his left hand. With his right hand he then passes the loop of the sling-rope over the load to

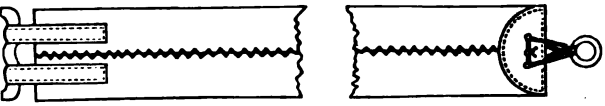


FIG. 41.—Mexican cinch (or synch).—[GRANT.]

paring and packing this form of saddle, instructions so important that a condensed abstract of them, with illustrations, is placed in a foot-note. The cross-tree¹ and other patterns of pack-saddles have also their advocates. Ambulance-chairs and litters could probably be adjusted with almost equal facility to several varieties of pack-saddles; what is essential is that there should be trained mules or ponies² and skilled packers. Until these indispensable adjuncts are provided, the improved cacolets and litters found useful in European armies cannot be advantageously employed in our service, and medical officers will probably resort in emergencies to the Indian drag or travée,³

No. 1, who passes the ends of the sling-rope through the loop and draws them tight. No. 1 then places the part of the load intended for his side of the pack on the aparejo against that already there, and, holding it with his left hand, he passes one end of the sling-rope to No. 2, who carries it under either branch of the rope already round the pack on his side and hands it back to No. 1, who brings both ends of the sling-rope together, draws them tight, and ties them in a square knot. The two men then adjust the load to balance it equally and place the



FIG. 42.—Fittings of pack-cinch.

pack-cover, a hemmed piece of canvas five feet square, over the load. No. 1 then takes the lash-rope, coiled in his right hand, grasps it near the cinch with his left hand, and throws the rope to its full extent to his right. He passes the cinch under the mule, hook from him, and, without moving the cinch, he places the rope on the centre of the pack lengthwise (FIG. 44). He then moves to the mule's shoulder and draws the rope forward two-thirds of its length, and, seizing it about six feet from the cinch, he passes it double to No. 2. No. 2 takes this double in his right hand and the hook of the cinch in his left; he moves his hands until he can feel that it is tight, when he passes the rear branch of the rope from above into the hook and passes the slack back to No. 1. No. 1 draws this slack tight with his left hand, and passing his right hand under his left he seizes the rope in front of the pack and passes it to the rear; he then passes the part of the rope in his left hand under the standing branch from rear to front, and draws it well up on the pack; he then pushes the bight thus formed below the aparejo. No. 2, in the meantime, takes the end of the rope and passes it under the front standing branch on his side, from rear to front, pushing it to the top of the pack, and throwing the end in front of the pack on No. 1's side; he then seizes the front standing branch with both hands, well down, placing his left knee against the aparejo; he is now ready to pull. No. 1 seizes the front branch on his side, and places his left shoulder against the pack; he then says 'pull.' No. 2 pulls, and No. 1 takes in the slack; this is continued until No. 1 says 'enough.' No. 2 leads the mule forward, while No. 1 sees that the pack is balanced. No. 1 passes to the rear, and pulls the branch under the aparejo tight. No. 2 passes to the rear, pulls the branch on his side tight, and passes it forward under the points of the aparejo. No. 1 goes to the mule's shoulder and takes the end of the rope, draws it tight, brings it down under the points of the aparejo and back to the centre of the pack, where he fastens it by drawing it under the standing branches, or, if it is too long, he passes it to No. 2, to be fastened in the same manner.

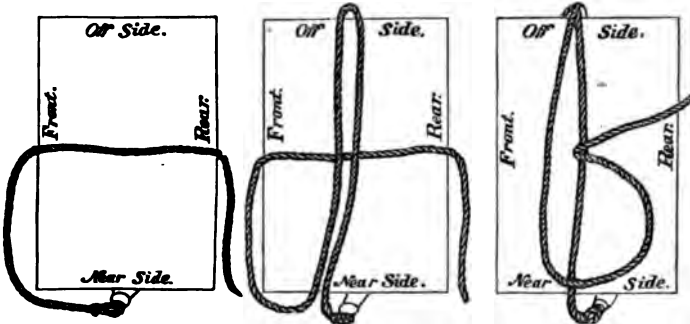


FIG. 44.—Diagram showing the manner in which the lash-rope passes round a pack.



FIG. 45.—Hudson Bay cross-tree saddle. [After LORD & BAINES.]



FIG. 46.—Modified cross-tree saddle. [After GALTON.]

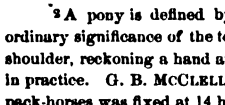


FIG. 47.—Mule laden with pack on cross-tree saddle.—[IBID.]



FIG. 48.—Pack-saddle tree. (After GALTON.)

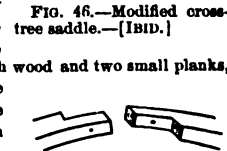


FIG. 49.—Joint of bent pieces. [After GALTON.]

¹ Dr. D. L. HUNTINGTON, U. S. A., and other medical officers, who have served west of the Rocky Mountains, frequently advert to the so-called cross-tree saddle used by the traders and explorers of New Mexico and the Northwest, and the employees of the Hudson Bay Company, in transporting their stores and peltries. LORD and BAINES (*op. cit.*, p. 465) give figures of two forms of this saddle: one (FIG. 45) the usual form; another (FIG. 46) made with natural forked branches. The girth used with this description of saddle is made in two parts, with eyelets at the end so that

gives the following directions for improvised pack-saddles: "Cut four bent pieces of tough wood and two small planks, season them as well as you can and join them together, as in the drawing, using raw-hide in addition to nails or pegs. Stuffed cushions must be tied, or otherwise secured, inside the planks. The art of good packing is to balance the packs accurately, and to lash them very tightly to the saddle. The entire load is then secured to the animal's back by moderate girthing. It is going on a false principle to wind one long cord round the horse, saddle, and packs, making, as it were, a great faggot of them."

² A pony is defined by COWPER: "a small horse; a horse less than fourteen hands high." S. JOHNSON says, "perhaps from *puny*;" but the ordinary significance of the term is the reverse of this,—stout-built, compact, and strong animals are often thus designated. Measuring at the fore-leg and shoulder, reckoning a hand at four inches, a horse under fifty-six inches in height is usually styled a pony; but this definition is not rigidly attended to in practice. G. B. MCCLELLAN, in his Report on European Armies in 1835-36, states (*op. cit.*, p. 248) that in the French service the average height of pack-horses was fixed at 14 hands 1½ inch to 15 hands 1 inch, and that of pack-mules at 13 hands 3 inches to 15 hands 1½ inch.

³ In the *Prairie Traveller*, p. 153, General MARCY relates that: "The prairie Indians have a way of transporting their sick and children upon a litter very similar in construction to the one just described, excepting that one animal is used instead of two. One end of the litter is made fast to the sides of the animal, while the other end is left to trail upon the ground. A projection is raised for the feet to rest against and prevent the patient from sliding down. Instead of canvas, the Indians sometimes lash a large willow basket across the poles, in which they place the person to be transported. The animals harnessed to the litter must be carefully conducted upon the march, and caution used in passing over rough and broken ground."

or to the two-horse litter, conveyances that have been fully described in the preceding pages. As I close this report, the following communication is received from New Orleans, dated March, 1877, from Assistant Medical Purveyor E. Swift, U. S. A :

"During the Mexican war, Lieutenant Schuyler Hamilton, aide to General Scott, was severely wounded by a lance, two and a half inches wide, thrust six and a half inches into the right lung from behind, at Mille Flores, a foundry where shot and shell were being manufactured for the Mexican army. The lieutenant was conveyed a short distance to headquarters at Chalco, where a horse-litter was constructed of tent-cloth and two long canal-boat setting-poles—the extremities of the poles serving as shafts, to which were harnessed a horse or mule in front and rear of the patient; on this litter he travelled comfortably several days, with the army on its march to the city of Mexico. Many sick and wounded were conveyed to the coast from the city of Mexico on litters provided with a covered frame-work for protection from the sun and rain. Litters were frequently improvised and made temporarily by means of blankets knotted at the four corners to two muskets; also a blanket passing under the arm and knotted over the opposite shoulders of two men, forming a seat between them, on which the patient was conveyed in comparative ease and comfort. Sometimes, wounded men were carried off the field on the backs of their comrades. I have also known wounded to be carried upon the backs of men, in a kind of chair, after the manner of conveying travellers over mountains in South America. The well-known Indian travois, rudely constructed of long poles and buffalo-hide—one end harnessed to a mule or horse while the other trails on the ground—almost equals the comfort presented in the first-described method, which I deem the best."

It was my design to treat somewhat more in detail of the different forms of cacolets and of double and single mule-litters used in foreign armies; but the limits allotted to this report are already attained if not exceeded. For particulars regarding the conveyances of Hill, Shortell, and

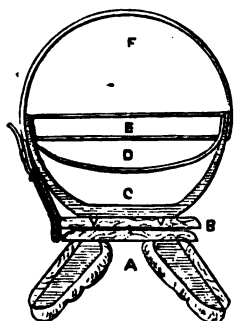


FIG. 50.—LOCATI'S single mule-litter. [After LONGMORE.]

Locati, I must refer to the admirable treatise on the transport of sick and wounded troops by Surgeon-General T. Longmore, my indebtedness to which I have repeatedly had occasion to acknowledge, and for descriptions of other European forms of cacolets and litters to the writings of MM. Legouest, Pirogoff, Gurlt, Van Dommelen, Grossheim, and others who have been cited in this report. The single mule-litter of M. Locati, of Turin, designed for the passage of the narrowest defiles, avoiding as far as possible obstructions from tree-branches overhead or impediments on either side, is regarded in Europe as about the best appliance of this sort. A cross-section of it is shown in the adjacent wood-cut. Assistant Surgeon W. J. Wilson, U. S. A., who recently accompanied an incursion of the troops of the Khedive upon the Abyssinians, informs me that camels were there advantageously used for sick-transport by the Egyptian troops. I had prepared wood-cuts of the camel-litters used by Larrey in the campaign in Syria, and the camel-kujawahs used in the Punjab, devised by Surgeon W. B. Webb of the Bengal service, but have not space to introduce them, and must again refer to the exhaustive work of Professor Longmore, and to the memoirs and historical and surgical relation of the *Armée d'Orient* of the illustrious Larrey, for information on this means of sick-transport, apparently well adapted for army use in Texas, New Mexico, and Arizona.

Whatever incompleteness there may be in this report as a theoretical disquisition, the practical views and suggestions advanced by a considerable number of experienced medical officers cannot fail to receive your appreciation.

I am, General, very respectfully, your obedient servant,

GEORGE A. OTIS,
Assistant Surgeon, U. S. A.

Brigadier-General JOSEPH K. BARNES,
Surgeon General U. S. A.

INDICATION OF CONTENTS.

	Page.		Page.
Introductory Observations	1	Dr. WILLIAMS's remarks on the use of horse-litters after the engage-	
Remarks on ambulance systems	3	ment at the Little Big Horn, June 25, 1876.....	21
Dr. SATTERLEE's report on the use of two-horse litters after O-kee-		Lieutenant G. A. DOANE's report on the construction of two-horse	
cho-bee.....	4	litters	22
Inspector-General MARCY on the construction of two-horse litters ...	4	Dr. CLEMENTS's memorandum on the construction and management	
Captain THISTLE's proposal for single litters for horse or mule	5	of two-horse litters	24
United States Army regulation two-horse litter.....	6	Dr. P. OZKI's comments on mule-litters and travées.....	24
Mule-chairs or cacolets	7-10	Dr. Mc GILLICUDDY's comparison of the two-mule litters and travées	25
Opinions of medical officers on cacolets and double mule-litters ...	11	Dr. GIBSON's remarks on mule-litters and travées	25
ROOKER's saddle-attachment for wounded soldiers.....	13	Dr. HUNTINGTON's comments on army sick-transport.....	27
Dr. McELDERRY's single-litter for mules.....	14-15	Comments on field sick-transport of the wounded, by Dr. CRANE and	
M. GOTCHET's adaptation of the hand-stretcher as a single litter for		General SHERMAN	28
a mule.....	16	Considerations on cacolets, litters, and travées	29
Dr. GREENLEAF's combined hand and horse-litter	17	Abstract of Lieutenant A. GRANT's instructions on packing the	
Dr. CLEARY's modification of the Indian travée	18	<i>apocéph.</i>	30
Dr. MUNN's report on the transport of wounded by mule-litters and		Remarks on pack-saddles.....	31
travées, on the Big Horn Expedition.....	19	Communication on sick-transport, by Assistant Medical Purveyor E.	
Dr. HARTSHOFF's report of the use of mule litters after an engagement		SWIFT, U. S. A.; and Concluding Observations	32
at Rosebud, Montana, June 18, 1876	20		



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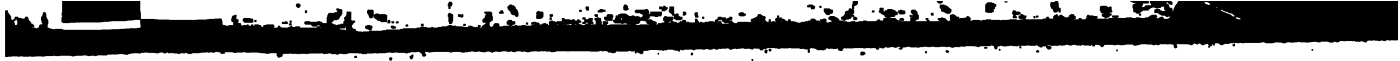




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